AVIATION WEEK

A McGRAW-HILL PUBLICATION

APR. 27, 1953

50 CENTS

TIME WAS when aircraft had no brakes. In those days, planes were light and slow enough to stop themselves before they "ran out of runway."

But as ships grew larger and faster, the problem of reducing the landing or ground run of aircraft became a threat to aviation's progress.

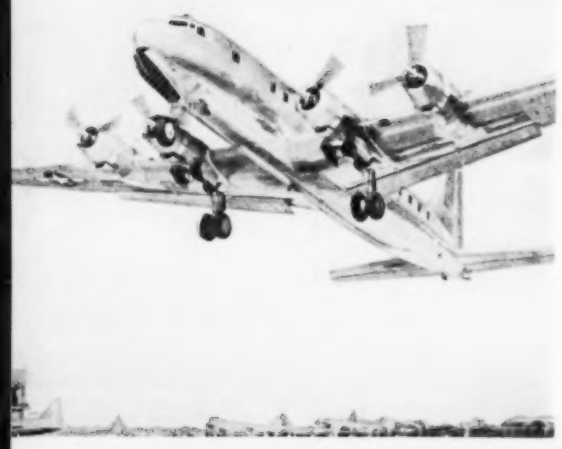
"Sprags" or claws were added to the tail skids, but these dug up the runways. Air brakes were found to be ineffectual at low speeds; automobile-type band brakes were too heavy and cumbersome. Ground loops and crack-ups were common.

GOODYEAR AVIATION PRODUCTS

50th ANNIVERSARY AVIATION GOODYEAR ONE OF THE PIONEERS

NOW the world's largest and fastest aircraft land safely on standard-length runways, thanks to Goodyear Disc Brakes which are used today on all types of airplanes.

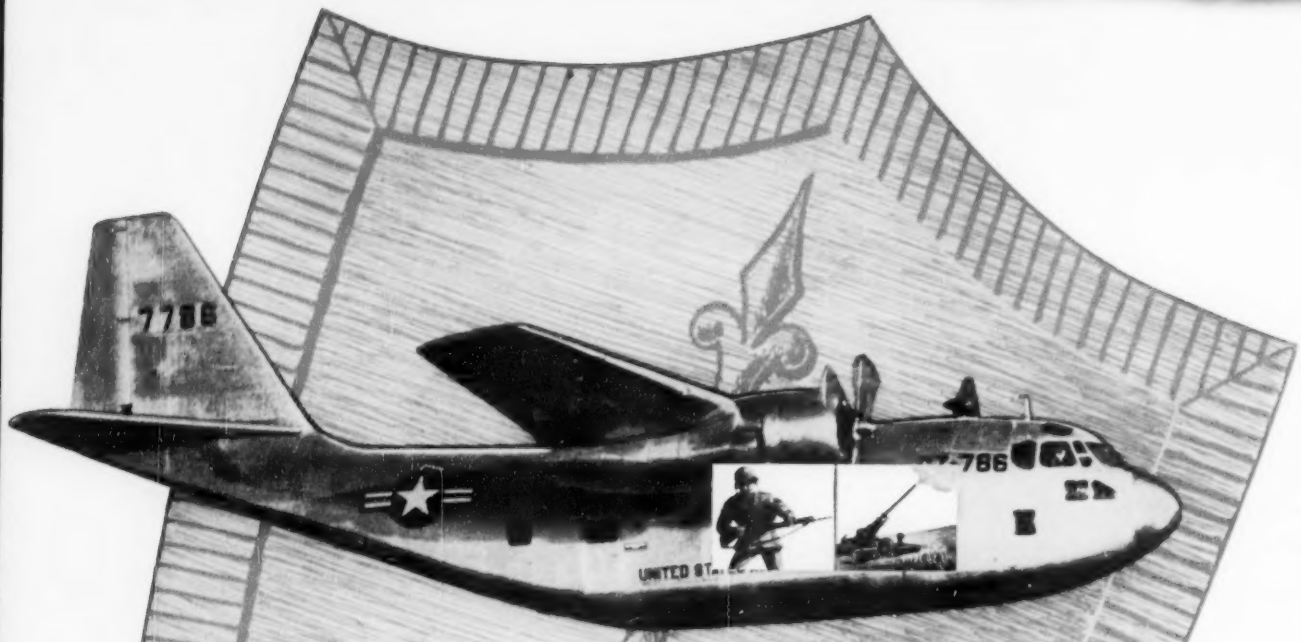
This amazingly compact and powerful braking system operates hydraulically and offers a velvety-smooth, nonbinding, nonfading action—effectively packed into a minimum of space.



This is an example of but one of many Goodyear Aviation Products which are serving aviation today. Goodyear has been contributing to aviation progress since 1909.

Goodyear, Aviation Products Division
Akron 16, Ohio
or Los Angeles 54, California

MORE AIRCRAFT LAND ON GOODYEAR TIRES, TUBES, WHEELS AND BRAKES THAN ON ANY OTHER KIND



SAFETY by Swedlow in the Chase C-123

Designed by the Chase Aircraft Co. of Trenton, New Jersey and now being built in the Kaiser-Frazer Willow Run plant, this huge twin-engine troop and cargo-carrying transport emphasizes safe and speedy delivery of personnel and supplies for the USAF.

An important safety factor in this transport is the use of SWEDLOW molded fiberglas fuel cell backing for the "Power Packages" supplied by Rohr Aircraft Co. of San Diego, world's largest producers of power packages for the aircraft industry.

For information on other recent developments and applications of SWEDLOW molded fiberglas or transparent glazing materials, contact the SWEDLOW plant nearest to you.

Swedlow PLASTICS CO.

LOS ANGELES, CALIFORNIA • YOUNGSTOWN, OHIO

Search and Research

● The "third degree" is but a superficial scanning compared to the trials a ball bearing must withstand in New Departure's Research Laboratory. Here, under conditions which pack years of normal use into a short time, engineers determine how to make the best ball bearings even better.

Production bearings and experimental designs, alike, take this "torture treatment." They are subjected to overspeeds and overloads, intense heat and cold, day and night operation for protracted periods.

Three decades of this search and research have produced the sealed rear wheel-bearing for motor cars, the self-sealed bearing for farm implement use, the tiny, jewel-like bearing for delicate instruments . . . and many other types to fit a host of applications.

You can specify New Departures and *know* that they are right for the job. Keep your eye on the BALL to be sure of your BEARINGS!

Vibration analyzer eliminates human error in scientific search for causes of noise in bearings.

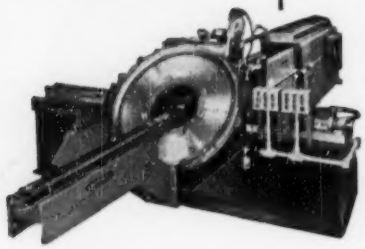
New Departure ball bearings are readily available at your equipment dealer or bearing distributor —supplied from the industry's largest network of warehouse stocks.

NOTHING ROLLS LIKE A BALL

NEW DEPARTURE
BALL BEARINGS

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT
Also Makers of the Famous New Departure Coaster Brake

THE BIG
NEWS!
IN AVIATION PRODUCTION
is what
LAPOINTE BROACHING
is doing for
GAS TURBINE PARTS



Literature is available describing Lapointe Broaching Machines, Tools, and Fixtures — and telling what they will accomplish in your plant to *speed production and reduce costs.*

Ask for Bulletin AW-14

LAPOINTE
MACHINE TOOL COMPANY
HUDSON · MASS · U. S. A.
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

Aviation Week

Volume 58 April 27, 1953 Number 17

(Table of Contents on Page 8)

46,623 copies of this issue printed

Robert W. Martin, Jr. ..... *Publisher*

Robert H. Wood ..... *Editor*

Robert B. Hotz
Executive Editor

Merlin H. Mickel
Managing Editor

Albert W. Bentz ..... News Editor
Alexander McSurely ..... Aviation Safety
David A. Anderton ..... Engineering
Irving Stone ..... Technical
G. L. Christian .. Equipment, Maintenance
Katherine Johnsen ..... Congress
Lee Moore ..... Transport
Philip Klass ..... Avionics

Scott Reiniger ..... New Products
Erwin J. Bulban ..... Special Assignments
Richard Balentine ..... Federal Agencies
William J. Coughlin ..... West Coast
Henry Lefer ..... News Desk
Gordon C. Conley ..... News Desk
Victoria Giaculli ..... Editorial Makeup
Leo T. Tarpey ... Printing & Production

DOMESTIC NEWS BUREAUS

Atlanta 3 ..... 1321 Rhodes-Haverty Bldg.
Chicago 11 ..... 520 No. Michigan Ave.
Cleveland 15 ..... 1510 Hanna Bldg.
Detroit 26 ..... 856 Penobscot Bldg.
Houston 25 ..... 1303 Prudential Bldg.
Los Angeles 17 ..... 1111 Wilshire Blvd.
San Francisco 4 ..... 68 Post St.
Washington 4 .. 1189 National Press Bldg.

FOREIGN NEWS SERVICE

Editor ..... Joseph K. Van Denburg, Jr.
London ..... Nathaniel McKitterick
Paris ..... Ross Hazeltine
Frankfurt ..... Gerald W. Schroder
Manila ..... Herbert Leopold
Mexico City ..... John Wilhelm
Rio de Janeiro ..... Lionel J. Holmes
Tokyo ..... Alpheus W. Jessup

Aviation Week is served by PRESS ASSOCIATION, INC., a subsidiary of Associated Press.

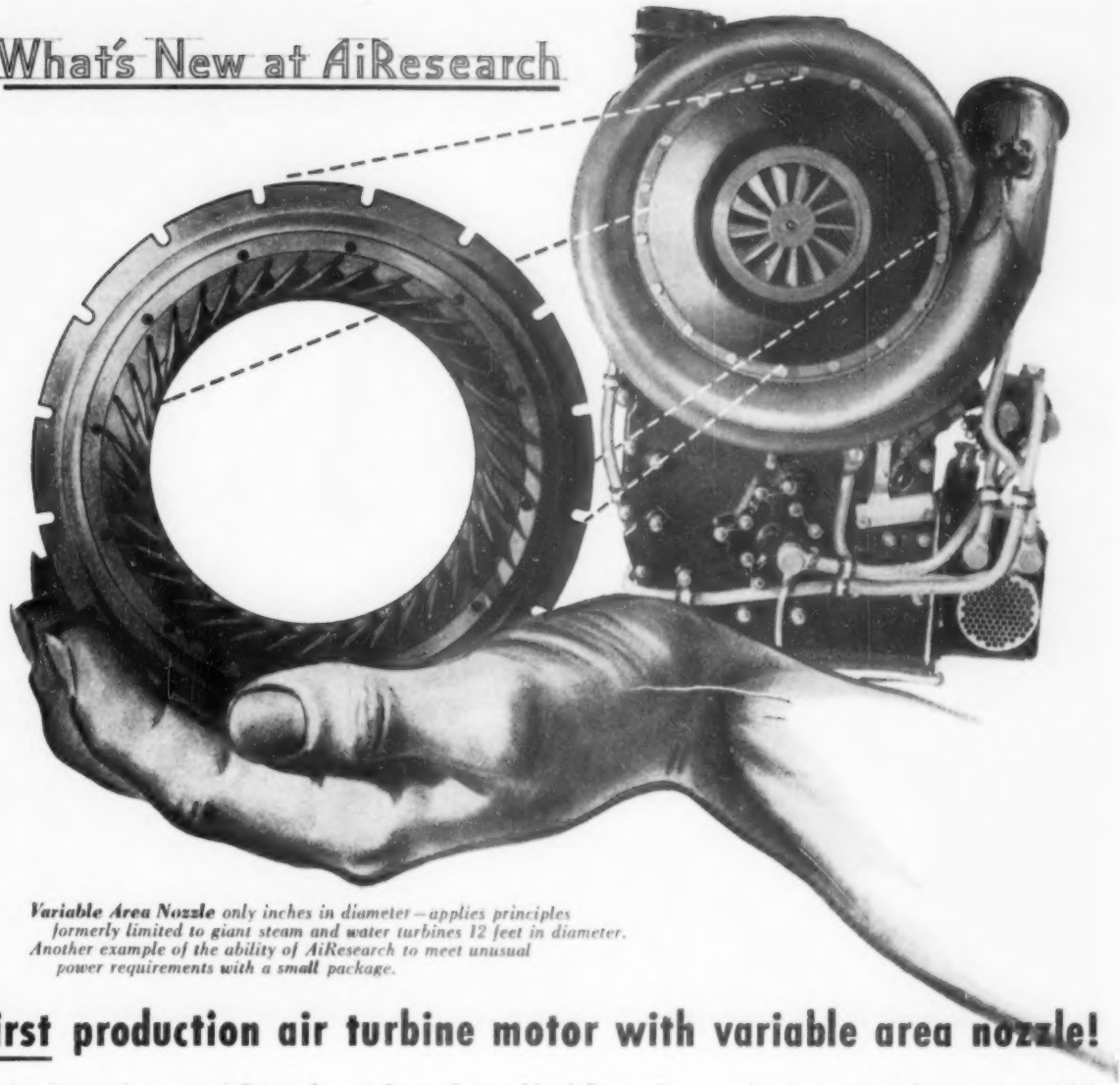
J. G. Johnson ..... *Business Manager*

Sales Representatives: J. C. Anthony, **New York**; H. P. Johnson, **Cleveland**; L. J. Biel, **Chicago**; W. E. Donnell, **St. Louis**; E. P. Blanchard, Jr., **Boston**; James Cash, **Dallas**; Robert H. Sidur, **Atlanta**; R. F. Dorland, Jr., **San Francisco**; C. F. McReynolds, **Los Angeles**; W. S. Hessey, **Philadelphia**. Other sales offices in **Pittsburgh, Detroit, London.** *Research and Marketing:* Catherine Miner.

AVIATION WEEK • April 27, 1953 • Vol. 58—No. 17
Member ABP and ABC

Published weekly by McGraw-Hill Publishing Company, James H. McGraw (1860-1948), Founder. **Publication Office: 99-129 North Broadway, Albany 1, N. Y.**
Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 W. 42nd St., New York 36, N. Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice-President, Publications Division; Ralph B. Smith, Vice-President and Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.
Subscriptions: Address correspondence to AVIATION WEEK—Subscription Service, 99-129 North Broadway, Albany 1, N. Y., or 330 W. 42nd St., New York 36, N. Y. Allow ten days for change of address.
Subscriptions are solicited only from persons having a commercial or professional interest in aviation. Position and company connection must be indicated on subscription orders.
Single copies 50¢. Subscription rates—United States and possessions, $6 a year; $9 for two years; $12 for three years. Canada, $8 a year; $12 for two years; $16 for three years. Payable in Canadian currency at par; other Western Hemisphere, $10 a year; $16 for two years; $20 for three years. All other countries, $20 a year; $30 for two years; $40 for three years. Entered as second-class matter, July 16, 1947, at the Post Office at Albany, N. Y., under Act of Mar. 3, 1879. Printed in U. S. A. Copyright 1953 by McGraw-Hill Publishing Co., Inc.—All Rights Reserved. Cable Address: "McGraw-Hill New York." Publications combined with AVIATION WEEK are AVIATION, AVIATION NEWS, AIR TRANSPORT, AERONAUTICAL ENGINEERING and AIRCRAFT JOURNAL. All rights to these names are reserved by McGraw-Hill Publishing Co.

What's New at AiResearch



***Variable Area Nozzle** only inches in diameter—applies principles formerly limited to giant steam and water turbines 12 feet in diameter. Another example of the ability of AiResearch to meet unusual power requirements with a small package.*

First production air turbine motor with variable area nozzle!

During the past few years, AiResearch scientists have pioneered a whole new power technology in the development and operation of *small* air and gas turbine motors.

An example is this 52HP air turbine motor, shown above. Now in production for leading turbine propelled aircraft, this motor is one of 23 basic pneumatic power machines developed and manufactured by AiResearch.

This motor incorporates a variable area nozzle, first developed by AiResearch.

Acting automatically, the nozzle precisely adjusts turbine torque to power requirements and greatly reduces the air consumption necessary with ordinary throttling controls.

The air turbine motor drives hydraulic pumps and constant-speed DC generators and alternators, formerly driven by the main engine. Its four accessory pads permit remote location of accessory functions, thus eliminating service operations in the engine nacelle.

Would you like to work for us? Qualified engineers, scientists and skilled craftsmen are needed here.

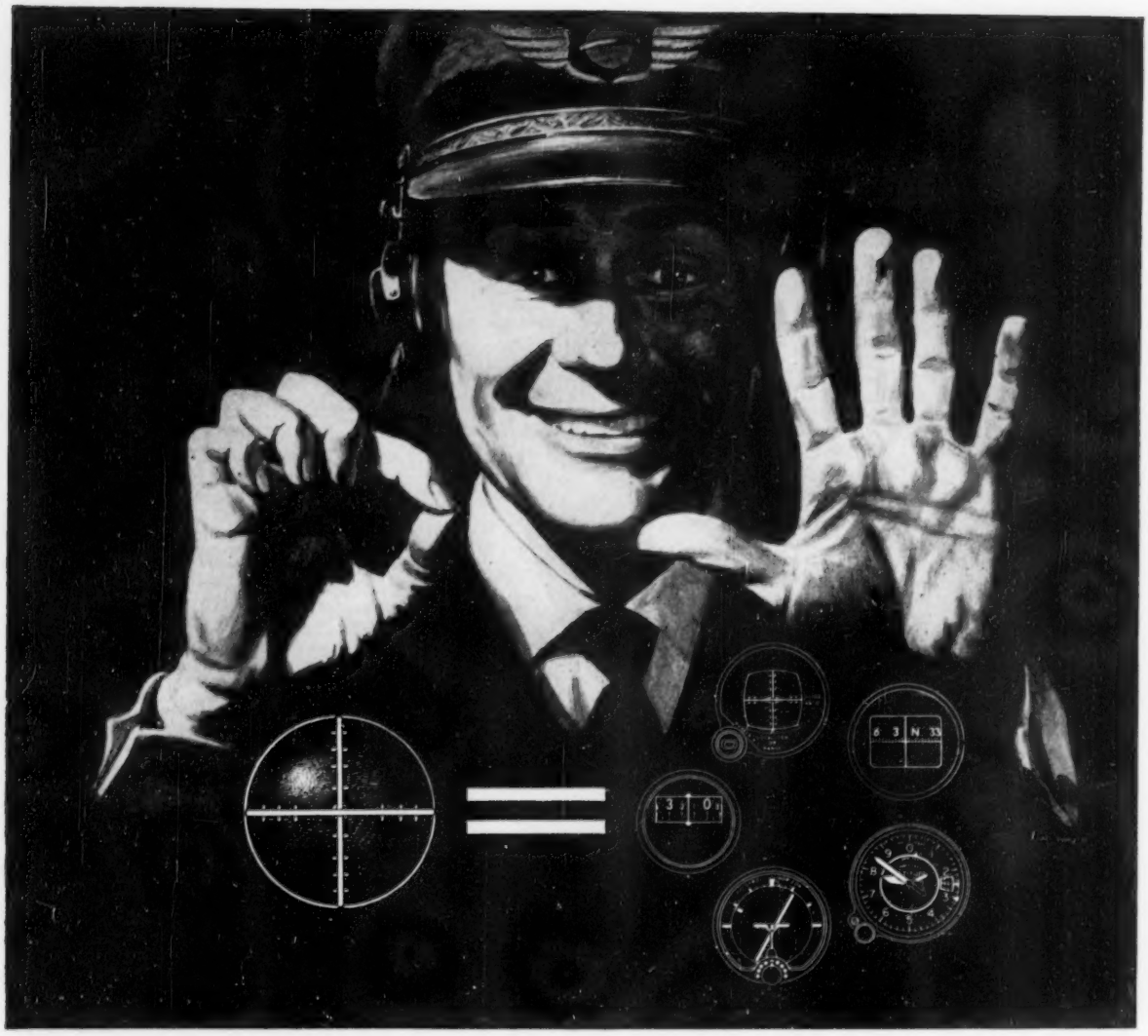
AiResearch Manufacturing Company

A DIVISION OF THE GARRETT CORPORATION

LOS ANGELES 45, CALIFORNIA • PHOENIX, ARIZONA

DESIGNER AND MANUFACTURER OF AIRCRAFT EQUIPMENT IN THESE MAJOR CATEGORIES

Air Turbine Refrigeration | Heat Transfer Equipment | Electric Actuators | Gas Turbines | Cabin Superchargers | Pneumatic Power Units | Electronic Controls | Cabin Pressure Controls | Temperature Controls



When Zero equals Five

Yes—it's a fact—the Sperry Zero Reader* Flight Director combines information supplied by *five* basic instruments...the gyro-horizon, directional gyro, magnetic compass, sensitive altimeter, and cross-pointer meter . . . for simplified manual control of aircraft.

Widely specified for military, passenger, and executive planes, the Flight Director reduces pilot fatigue during en route flying. It combines the necessary information on a simple two-element indicator and directs the pilot how to move the controls to maintain altitude and heading with ease. This simplified director presentation . . . where the pilot flies "zero" . . . is always used in the same manner, whether for leisurely cruising or for making landing approaches under rough conditions.

The Flight Director was developed by Sperry with the cooperation and encouragement of the All-Weather Flying Division, USAF, and the Air Transport Association. Its drama starts more than forty years ago with Sperry's first research in gyroscopic flight. And the end of such research and development will never be in sight. For Sperry's program is *continuous*. As it works for today, it pioneers for tomorrow, meeting and solving such complex problems as are presented in the fields of jet aircraft and guided missiles.

*T. M. REG. U. S. PAT. OFF.

SPERRY GYROSCOPE COMPANY
DIVISION OF THE SPERRY CORPORATION

GREAT NECK, NEW YORK • CLEVELAND • NEW ORLEANS • BROOKLYN • LOS ANGELES • SEATTLE • SAN FRANCISCO
IN CANADA • SPERRY GYROSCOPE COMPANY OF CANADA, LIMITED, MONTREAL, QUEBEC

NEWS DIGEST

Domestic

Western Air Lines DC-6B crashed in San Francisco Bay during an approach to Oakland, Calif., last week, minutes after 44 passengers were unloaded at nearby San Francisco airport. Eight of the 10 persons still aboard were killed.

Colonial Airlines set a new air safety record this month, completing 23 years of carrier operations without a single fatality or serious injury to a passenger or crew member.

Braniff Airways fired 500 members of Air Carrier Mechanics Assn. (AFL) at Dallas last week after the workers refused to call off a walkout touched off by the dismissal of an apprentice and re-assignment of a maintenance crew chief.

Twenty witnesses—representing scheduled carriers, nonskeds, Air Force and the Puerto Rican government—are scheduled to testify on the role of irregular airlines in air transportation during Senate Small Business Committee hearings Apr. 29-May 1.

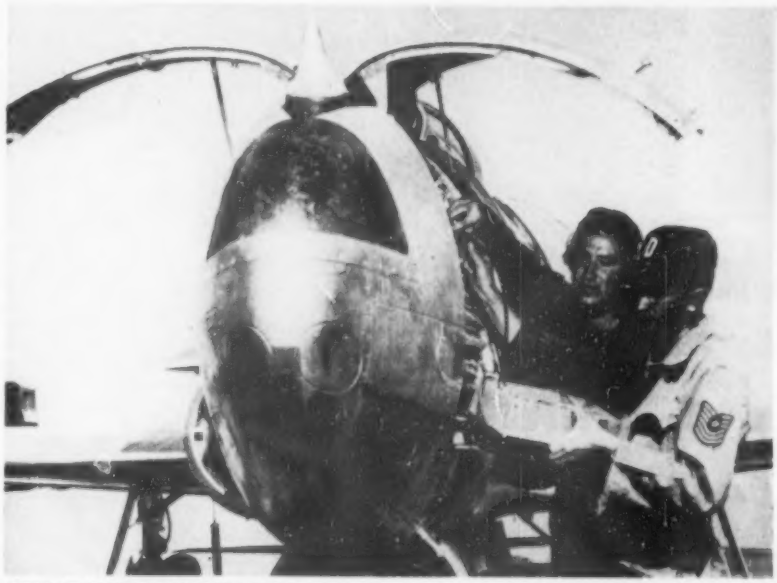
Scheduled airlines turned timetables ahead one hour this week (Apr. 26) in cities on Daylight Saving Time, making arrival and departure schedules conform for the first time to local clocks.

Lt. Gen. Elwood R. Quesada (AF Ret.) is expected to be elected a director of Lockheed Aircraft Corp. at the annual meeting of stockholders May 5 at Burbank, Calif.

Maj. Gen. J. F. Phillips (USAF Ret.), former commanding officer of Cambridge, Mass., AF research center, has been named to head up Aircraft Industries Assn.'s new guided missle committee which will draw up a manufacturers' cooperative program in research, engineering, design, development, construction and testing.

Peter D. Freytag, 25, president of American Aircraft Corp., Teterboro, N. J., was killed Apr. 17 when the Spitfire Mark 24 he planned to fly in the 1953 International Air Race next October crashed near Hillburn, N. Y.

New low-frequency ADF (automatic direction finder) has been developed by Gavco Corp. to overcome static problems of LF equipment and line-of-sight limitations of VHF; service trials by major overseas airlines are scheduled to be held.



SPERRY ROBOT CONTROLS in nose of Lockheed QF-80 pilotless jet plane used in current nuclear energy weapons tests are pre-flight checked by ground "beep pilots." The QF-80 can be taken off, flown and landed accurately by radio signals and radar from ground control stations or accompanying "director" Lockheed DT-33 jet two-seater. Note antenna projecting above plane's nose.

Garland plant of Temco Aircraft Corp. is the new name of Luscombe Airplane Corp., merged recently into the parent company.

Trevor Gardner, World War II chief of atomic bomb and rocket research at the California Institute of Technology, has been named special assistant for Air Force research and development.

Stratocruisers have flown more than 86,747,931 mi. since the first one went into operation four years ago, Boeing Airplane Co. reports.

Civil aircraft manufacturers exported 38 lightplanes valued at $236,099 during March, increasing the number of foreign shipments this year to 90 units.

Financial

Douglas Aircraft Co.'s net earnings increased sharply during the first quarter of fiscal 1953 to $4,389,787, and sales climbed to $231,654,268—more than double the Santa Monica, Calif., firm's net earnings of $1,997,096 and $81,271,045 in sales for the same period of fiscal 1952. Backlog at the quarter's end was $2,028,000,000, 88% in unfilled military orders and 12% commercial.

Reaction Motors, Inc., Rockaway, N. J., reports record sales totaling $4,942,000 in 1952, breaking the previous high of $4,637,000 in 1951. Net profits after taxes declined to $116,000 from the preceding year's figure of $145,800.

Cessna Aircraft Co., Wichita, ended the first half of the current fiscal year with sales of more than $21 million, an increase of $2.5 million over the first six months of fiscal 1952. The airframe manufacturer has authorized a 25-cent stock dividend.

Hawaiian Airlines reports net profit of $129,676 for 1952, compared with $39,194 in the preceding year.

International

C-46 operated by Aigle-Azur Co. crashed and burned near Hanoi, Indo-China, Apr. 16, killing 26 persons.

British Overseas Airways Corp. reports net profits for the first 10 months of its current fiscal year of $394,800, a $3,231,200 decrease from the corresponding period last year.

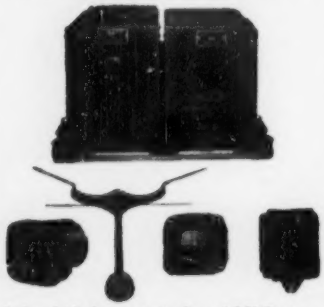
British European Airways began flying Vickers Viscounts this month, adding the turboprop transports to Comet jet liners put into operation on BEA routes last year. Company has five Viscounts, 21 more on order.

KNOW where you are! with OMNI!

Aircraft Radio Corporation

VHF

Navigation Equipment



Safe, drift-free, static-free OMNI gives you a reliable signal to follow, whatever your bearing. And ARC's compact Type 15D VHF Navigation Equipment makes OMNI available in executive aircraft of any size, as well as to private and transport aircraft. Just tune in OMNI and keep the needle of your ARC indicator on zero.

In addition to OMNI navigation, the 15D provides for use of the visual-aural ranges, and amplitude runway localizers. Add transmitter and receiver units of ARC's Type 12 equipment and you have independent, static-free voice communication.

Whatever your needs in navigation and communication, there is ARC equipment to meet them. Write today for all the details.

ARC

All ARC Airborne equipment is Type Certificated by CAA. It is designed for reliability and performance, not to meet a price. Installations for both single and multi-engine planes are made only by authorized service agencies.

Aircraft Radio Corporation

BOONTON, NEW JERSEY

Dependable Electronic Equipment Since 1928

The Aviation Week

April 27, 1953

Headline News

CAB Adopts Cockpit Standard..... 13
Let Investors Share Profits: Damon... 14
New Chase Carrier Makes Debut..... 15
CAA Lifts Airport Aid Freeze..... 16
B-47 Workout 17
Bell Demonstrates New Model 47G.... 18
Flying a Jet Bomber in 'Combat'..... 20
Boeing Lists Executives Salaries..... 23
Cornell Center Sets Up Targets..... 25
UAL Plans Giant Loading Dock..... 26
Ansett Fits Jets to DC-3 Fleet..... 26

Aeronautical Engineering

Two Paths to Fighter Superiority..... 30
Wide Peace Use for Earth Satellite.... 39
Broader Education for Engineers..... 40
AF Starts Flight Safety School..... 43
Jet Tips Make Copters Safer..... 43
Three-Way Camera Records Data..... 44
McDonnell Opens Jet Test Facility.... 44
British Raising Jet Production..... 46

Production

Fast Miller Gives Fine Finish..... 52

Avionics

Putt Challenges Avionics Industry.... 64
Avionics Companies Add Space..... 68
Plug-in-Circuits for Easier Design.... 68
Lab Testing Gets New Equipment.... 71

Equipment

New Oil Will Take Jets Higher..... 72
Slip-Tube Joint Uses No Fitting..... 76
Ni-Ca Cells Hit at Cause of Crashes.. 77

New Aviation Products

Ultrasonic Cleaner Shakes Off Dirt.... 82
Nickel Sheet Lets Air Through 82

Air Transport

Fare Hearing Up to Denny..... 91
Denny Holds Balance in CAB..... 92
India Airlines Face Nationalization.. 93
CAB Calendar 93
Aircoach Future 94
NWA Buys Super Connie Fleet..... 94
National Executives Gain Stock..... 95

Editorial

Experiment in Publicity..... 106

Departments

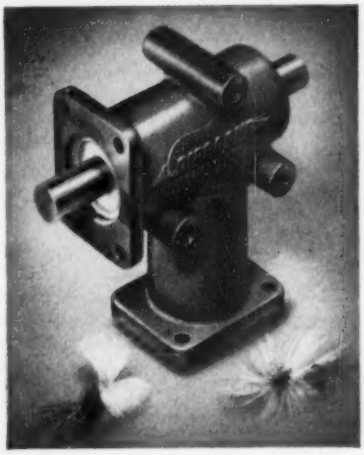
News Digest 7
Picture Page 9
Who's Where 11
Industry Observer 11
Washington Roundup 12
Production Briefing 56
Navy Contracts 58
Fast Writeoffs 60
What's New 60
Also on the Market..... 89
Shortlines 95
Cockpit Viewpoint 104
Aviation Calendar 104

Picture Credits

7—Sperry Gyroscope Co.; 9—McGraw-Hill World News; 14—(top) Bell Aircraft Corp.; 15—Chase Aircraft; 16—Levy-Shipp; 17—Boeing-Wichita; 18—Lockheed; 20—Derek Wood; 25—U. S. Army; 31—(top) USN; (center) Bell Aircraft Corp.; (bottom) Harold G. Martin; 64—USAF; 72—Standard Oil Development Co.; 92—CAB; 94—NWA; 95—PanAm.

Need a Compact

RIGHT ANGLE DRIVE?



Perhaps the compact design of ANGLgears—they fit into the palm of your hand—will solve your problem. And these standardized right angle bevel gear drives have the capacity of units many times their size. Model R-300 is rated at 1/3 hp at 1800 rpm —Model R-320 at 1 hp. Both models have hardened gears and ball bearings, are lubricated for life. Both can be supplied with either 2 or 3-way extensions too.

ANGLgears are described fully in the I.A.S. Aeronautical Engineering Catalog. We suggest you refer to this publication for complete data.

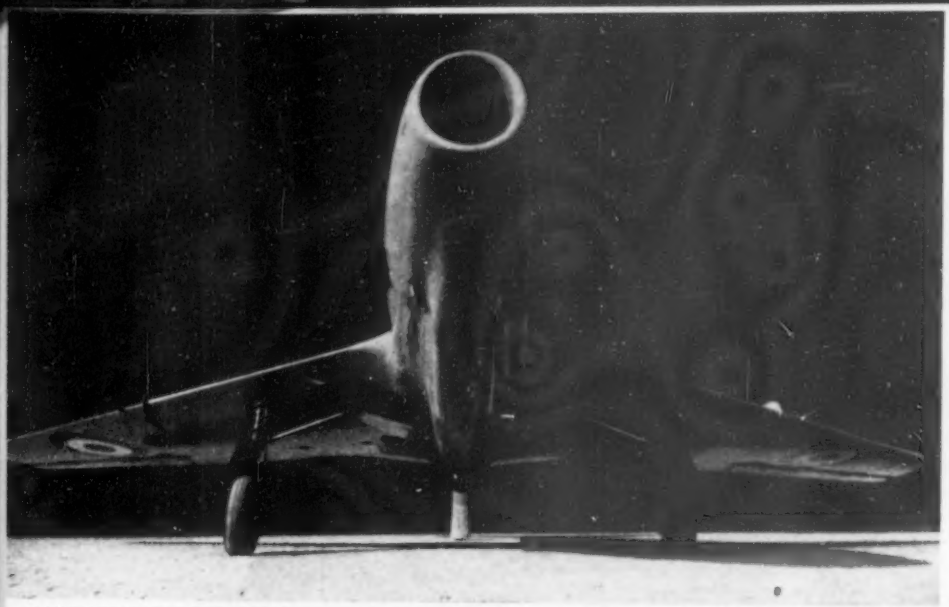
AIRBORNE

ACCESSORIES CORPORATION

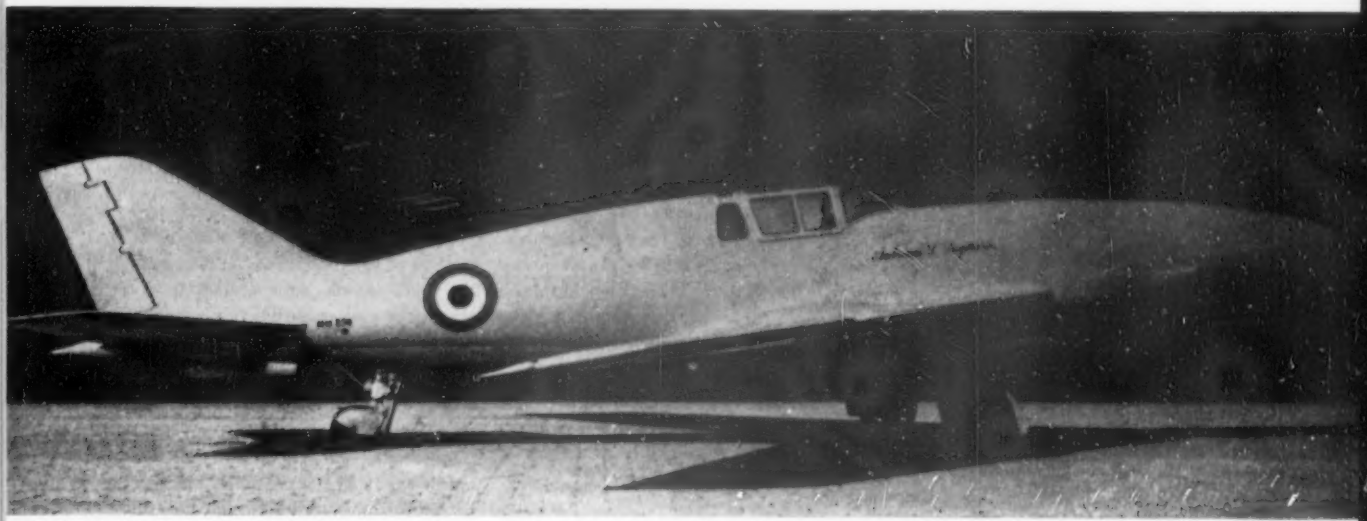
1414 Chestnut Avenue

Hillside 5, New Jersey

Italians Test New Jet Fighter Prototype



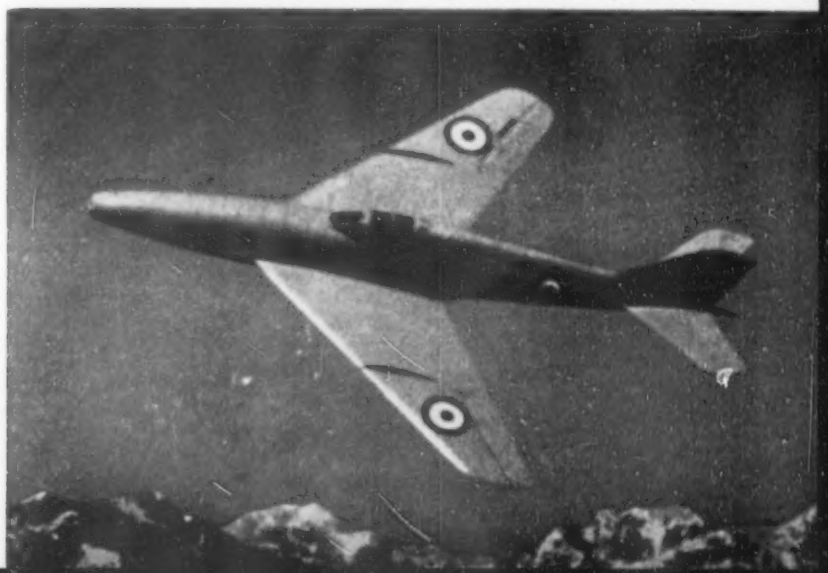
AMBROSINI SAGITTARIUS is of all-wood construction and features nose intake for its single 900-lb.-thrust Turbomeca Marbore turbojet. Note plane's wing fences.



PROFILE VIEW of Sagittarius which is serving as a prototype for an all-metal fighter plane planned for the transonic speed range. The turbojet exhausts beneath the fuselage under the cockpit. Landing gear is of the conventional type with retractable tailwheel.

COWL open showing ease of access to jet engine.

IN FLIGHT the Sagittarius displays its 45-deg. wing sweep. Gross weight is only 4,500 lb.

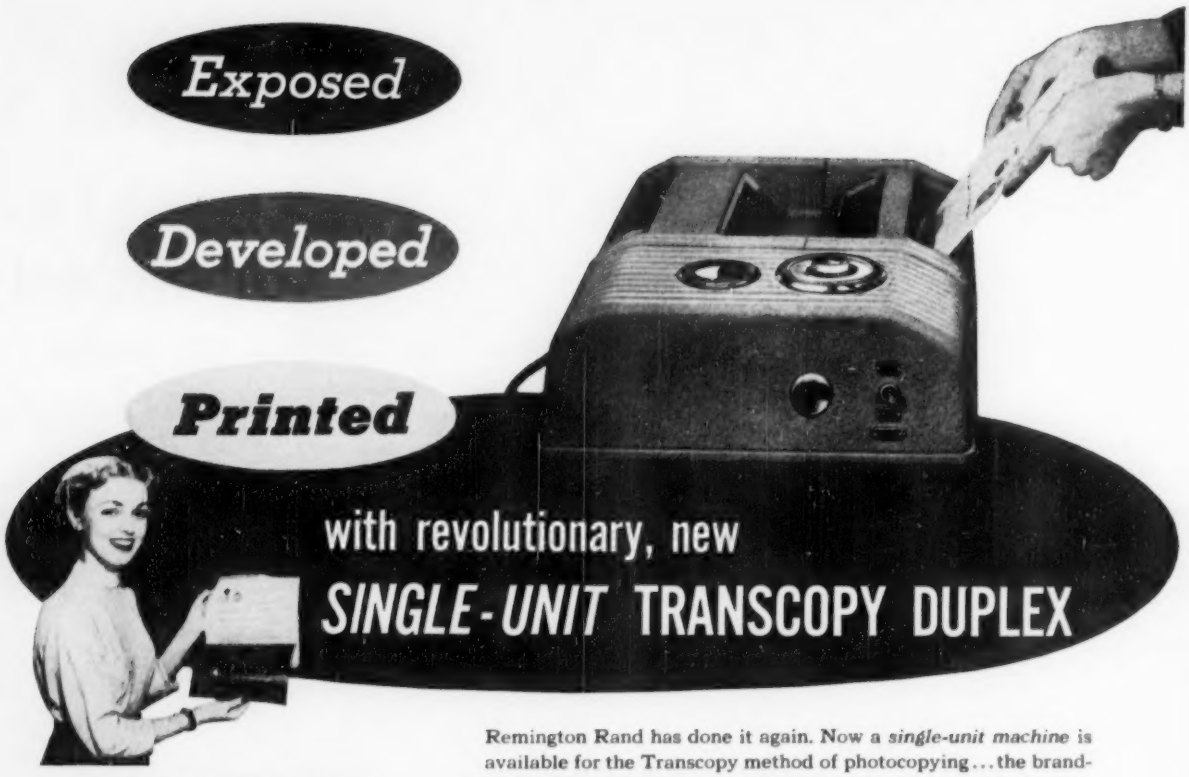


Photocopies in SECONDS!

Exposed

Developed

Printed



with revolutionary, new

SINGLE-UNIT TRANSCOPY DUPLEX

Remington Rand has done it again. Now a *single-unit machine* is available for the Transcopy method of photocopying... the brand-new Transcopy Duplex. This space-saving, time-saving, work-saving development gives you, in seconds, positive ready-to-use photocopies of any record, written, printed or drawn – up to 14½" wide and of any length.

CHECK *ALL* THESE BENEFITS FOUND *ONLY* IN TRANSCOPY DUPLEX

- Single Unit
- Economical
- No Installation Charge
- Use Anywhere
- Compact — Sturdy
- Any Length Copy
- Clean
- Versatile
- No Darkroom
- No Running Water
- No Drying Time
- Positive Prints
- Fastest Method
- Simple to Operate
- 100% Accurate
- Two Models

HERE'S HOW TRANSCOPY DUPLEX WORKS

Insert the document to be copied, with a sheet of Transcopy negative paper, in the front slot of the unit. Electrically driven belts carry the sheets thru the unit exposing the print and ejecting both sheets thru the second slot. Return the original to normal use and insert the exposed negative sheet with a sheet of positive Transcopy paper in the third, for development. Again, electrically driven rollers pull the sheets thru the developer and eject the sheets from the rear slot. Wait just a few seconds for printing to take place, separate the sheets and you have a perfect, ready-to-use positive print – black printing on white background.

GET ALL THE ANSWERS IN FREE FOLDER

Remington Rand INC. ROOM 1861, 315 FOURTH AVE. NEW YORK 10, NEW YORK

Gentlemen: I am most interested in finding out how I can use the Transcopy photocopying method in a single machine. Please send me, without obligation, free folder P-344 explaining in detail the operation of Transcopy Duplex.

NAME_____ POSITION_____

FIRM_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

WHO'S WHERE

In the Front Office

Edward H. Farmer, former Lockheed Aircraft Corp. works manager, has been elected vice president-manufacturing of Pacific Airmotive Corp., Burbank, Calif.

Dwain E. Fritz, former director of engineering and assistant to the president of Jack & Heintz, Inc., has joined Royal Electric, Inc., Jamestown, Ohio, as executive vice president.

N. George Belury is new vice president of American Brake Shoe Co., New York.

Harold G. Brilmyer has been named vice president-research of Huck Manufacturing Co., Detroit.

Harry B. Coen, former vice president of General Motors, has joined Eastern Air Lines as a management consultant.

Changes

F. C. Stouffer has been appointed general superintendent of Kaiser-Frazer Corp.'s aircraft fabrication department, Willow Run, Mich.

C. A. Hulsemann has been named manager of the airplane landing gear department, Goodyear Aviation Products Division, Akron, succeeding **J. E. Leonard,** who resigned to join Cessna Aircraft Co., Wichita. Other changes: **W. A. Carlson,** assigned to Goodyear's electrol thermal deicing and rubberized fabric departments, and **W. H. Inlow,** new field representative, San Antonio, Tex.

L. M. Greening is air cargo sales manager, Pacific Northern Airlines.

H. J. Roth has been appointed operations manager for American Airlines at Lockheed Air Terminal, Burbank.

Kenneth Atwell has been promoted to shop and overhaul supervisor for Mohawk Airlines.

Frederick R. Kearns and **Theodore C. Pawlett** are new assistant comptrollers at Canadair, Ltd., Montreal.

James E. Davis has joined Seaboard & Western Airlines as operations engineer. **Robert Brass** is new assistant director of sales.

Jack M. Bowman has joined the operations department of the Air Transport Assn. of America, Washington, D. C.

Honors and Elections

W. J. Kunz, Jr., Bendix Aviation Corp. engineer, last week was awarded the Wright Brothers Medal of the Society of Automotive Engineers for 1952 for his paper on "A New Technique for Investigating Jet Engine Compressor Stall and Other Transient Characteristics."

Martin Goland, associate director-engineering at Midwest Research Institute, Kansas City, Mo., has been reappointed to NACA's committee on aircraft construction.

P. H. Cummings, general manager of the Air Express Division, Railway Express Agency, is celebrating his 50th year in freight transportation.

INDUSTRY OBSERVER

► USAF Sabre pilots in Korea report they are now able to outmaneuver MiG-15s at high altitudes with the additional thrust available in late-model F-86 engines. The General Electric J47-27 that powers the F-86F has well over 6,000 lb. thrust. Sabre pilots report that MiG-15s are spinning out of tight turns at high altitudes trying to follow maneuvers the new Sabres can make with no trouble.

► Recent British reports that USAF is considering building a British medium bomber in the United States—probably the Avro Vulcan or Vickers Valiant—are considered pure sales propaganda by the Pentagon. USAF believes it is well ahead of RAF in medium and heavy jet bombers.

► United Aircraft Corp. finally has confirmed in a letter to its stockholders Aviation Week's prediction (Feb. 4, 1952, p. 11) that the North American F-100 (Sabre 45) will be powered by a Pratt & Whitney J57 turbojet.

► Douglas Aircraft's logistics carrier designed for a 100,000-lb. payload will be designated the C-132 and is scheduled to be powered by four new Pratt & Whitney turboprops delivering about 15,000 equivalent shaft horsepower. The new P&WA turboprop is based on the split-compressor design featured in the J57 turbojet.

► Defense Department has confirmed the Navy's report to Aviation Week (Mar. 16, p. 18) that the $154-million Westinghouse J40 production program for Ford's Lincoln Mercury Division at Romulus, Mich., has been canceled.

► Convair XF2Y-1 Sea Dart delta-wing water-based fighter with a hydroski landing gear made its first test flight recently, remaining aloft over San Diego Bay for about 10 min. Convair test pilot Sam Shannon was at the controls.

► First of the three Republic Aviation F-84Hs being developed as flying test beds for supersonic propellers will be shipped to Edwards AFB for flight testing late this summer, with the other two planes scheduled to follow shortly. The F-84H program is a joint USAF-Navy venture to test highspeed propellers developed by Curtiss-Wright, Aeroproducts Division of General Motors and Hamilton Standard. An Allison T54 turboprop will power all three F-84Hs. One of the propeller systems will use two sets of three blades, all rotating in the same direction with controls rigged to counteract the torque.

► NACA is doing basic research at Cleveland on application of atomic power to aircraft propulsion. NACA's research does not involve a nuclear reactor but covers turbines, compressors and heat transfer problems.

► Bristol Aeroplane Co. of England will announce shortly three new versions of its Britannia turboprop transport. They are: the Mark 200, a freighter; Mark 250, a mixed passenger-cargo version, and the Mark 300, a passenger model. All of the new versions will feature an extra 10 ft. added to the original Britannia fuselage, gross weight of 155,000 lb., and payload of 30,000 lb. Higher gross is made possible by the new Proteus Mark 3 rating of 4,150 eshp. BOAC has ordered three Mark 200s, Qantas six Mark 300s.

► Firm contract for offshore procurement of Hawker Hunter fighters is scheduled to be signed in Paris soon. Final arrangements will call for more than $100 million to be allocated for the project, including production by Hawker in England and building the airframe under license in Holland by Fokker.

► Airline pilots are divided on the question of turning on wing ice-detection lights for anti-collision recognition. Some pilots report that these lights tend to create an optical illusion as to which direction the wing-lighted plane is traveling.

Washington Roundup

More Than Money

Far-reaching decisions by President Eisenhower's top-policy National Security Council on the fiscal 1954 military budget may go beyond simple money allocations. They will greatly influence and, perhaps, materially alter the future roles, missions and composition of the services.

Observers are watching particularly the outcome on guided missile programs, now being pushed by all three services.

Key to some of the decisions may be found in these three policies announced in the President's pre-election defense speech:

• **Eliminate duplicate weapons programs.** "We cannot pretend to do everything in every field all of the time. . . . Whenever a new weapon comes from the laboratories, all the services . . . demand the right to use it . . . (there) is the almost inevitable demand of each service to do the research, development, and production work on new weapons. . . ."

• **Simplicity of design.** "In war, the simple and expendable weapons may, in the light of time and production facilities, be the most satisfactory."

• **Emphasize research and development.** "The progress of science warns against putting too much confidence in today's best weapon for soon it may be obsolete."

The Eisenhower defense budget is due to reach Congress by May 1.

Opposition to Defense Cuts

Senate's Democratic Policy Committee, under the leadership of Sen. Lyndon Johnson, has taken a stand against defense cuts, indicating the cuts face organized opposition. In speeches on behalf of the policy group:

• **Sen. Richard Russell** observed: "When Russian officials actually order slashes and stretchouts in the Russian arms program, we may well consider a reduction of our own military strength."

• **Sen. Stuart Symington** wondered why there is no talk of increasing the defense budget, only talk of decreasing it. His point: Since three years ago, Russia has increased its lead in airlift and submarine lift to deliver atomic attack.

Carrier: Top Priorty

Navy again this year is giving top priority in its shipbuilding program to a Forrestal-class carrier. A minesweeper program, involving only a small outlay, is the only program with higher priority. This means that only elimination of virtually all of the $995 million Navy wants for shipbuilding over the coming year or a specific ban will hold back the launching of a third new carrier.

In its presentations for the carrier, Navy will highlight the No. 1 priority Russia is giving its sub program and urge a strong carrier force as the only effective answer to the sub threat. USAF spokesmen concur with Navy that once subs reach the shoreline there is no effective defense against rockets and missiles they might fire.

Nuclear Carrier: By 1960?

Navy's third carrier isn't going to be designed for a nuclear powerplant, as originally indicated. The estimate now is that the fourth or fifth carrier will be so powered. With four years construction time, this means it will be around 1960 before a nuclear-powered carrier is in operation.

Some Navy men now say it would have been logical to give the carrier plant priority over the sub plant. Its larger size raises fewer engineering problems than the smaller sub plant. Some observers feel the Navy edged into the ship nuclear power field with the sub because that program wasn't confronted with USAF opposition.

Army Air Procurement

Army has put off its push for authority for direct procurement of its own aircraft for the time being.

Army isn't seeking cognizance over aircraft plants. But it wants authority to go directly to the service with plant cognizance. At present, all Army procurement at Naval plants is done by Air Force.

With a tough battle ahead for its $200-million helicopter program and a new Administration, Army apparently has decided the time isn't opportune to aim for a showdown on procurement authority. Army continues to think, however, it would save money and time by cutting out middleman red-tape.

Local Service Hopes

Local service lines now are more hopeful of getting assistance from the Canadian government than they are of U. S. aid in production of a plane that would make their operations economic:

• There is some optimism that the Canadian government will grant Canadair, Ltd.'s request for guaranteed purchase of a large number of CL-21 twin-engine transports for government-owned Trans-Canada Air Lines and the Canadian military forces.

• So far, however, USAF and Navy have turned down development financing of a plane suitable for local service operation because of the initial cost involved. Navy's cost on converting C-47s to Super DC-3s, though, is now reported up to $425,000. This approaches the estimated cost of a new plane.

Subsidy Separation Notes

• Rep. Carl Hinshaw will lead a move in House Commerce Committee to kill all airmail subsidy separation legislation. In view of CAB's administrative separation disclosing airlines receiving subsidies, he doesn't think a law is necessary now. Hearings tentatively are scheduled to start May 5.

• Indications are that Senate Commerce Committee hearings won't start until too late for decisive action.

• Although 24 senators, one-fourth of the membership, have rallied in support of the Kennedy Subsidy Separation Bill, vigorously opposed by Air Transport Assn., they are not the key men. Only two, Sen. Andrew Schoeppel and Sen. John Cooper, are members of the commerce group.

• Sen. John Kennedy is giving some thought to sidestepping this committee by framing the legislation as a reorganization of Civil Aeronautics Board. This would be channeled to the Committee on Government Operations, of which Kennedy is a member. Three others on this committee are co-sponsors of Kennedy's bill: Sen. Karl Mundt, Sen. Hubert Humphrey, Sen. Henry Jackson.

—Katherine Johnsen

AVIATION WEEK VOL. 58, NO. 17
APRIL 27, 1953

CAB Adopts Airliner Cockpit Standard

- **Regulation for new-type transports is patterned from proposals of aviation industry and the military.**
- **New airworthiness requirements also call for means of indicating reversed propeller pitch to pilots.**

By Alexander McSurely

Seldom in U. S. aviation history has there been such widespread agreement on a new regulation as that greeting the Civil Aeronautics Board decision to standardize cockpits of new-type transport aircraft.

Tailored to fit proposals of the aviation industry and military services, as summed up in the recent report of the Society of Automotive Engineers cockpit standardization committee, the regulation is part of new airworthiness requirements CAB has adopted to go into effect May 16.

Basis of the SAE cockpit arrangement is three-fold:

- Make actuation of controls (except control column and rudder pedals) forward, upward or clockwise for increased performance and aft, down or counterclockwise for decreased performance.
- Locate primary controls so they will be readily accessible and operable for crew members assigned to use them; secondary controls will be within reach, but with some compromise permitted as to ready accessibility.
- Arrange inter-related controls, such as landing gear and wingflap levers, so possibility of mistaking one for the other will be reduced to a minimum.

Three types are considered:

- Dual cockpit without flight engineer.
- Dual cockpit with jumpseat station for flight engineer but designed for flight with or without an engineer, according to operator's requirements.
- Dual cockpit with separate flight engineer station designed for continuous inflight operation.

▶ **Human Engineering**—Growing acknowledgement of importance of functional aircraft design in reduction of crew fatigue and pilot error is responsible for the painstaking industry study that has resulted in the new standardization requirements.

Example of how the new requirements work is seen in effective separation of wingflap and landing gear control positions.

Here is how the new Section 4B. 353 handles it.

- **Wingflap control** shall be located on top of a pedestal aft of the throttles, centrally or to the right of the pedestal centerline and not less than 10 in. aft of the landing gear control.
- **Landing gear control** shall be located to the left of the centerline of the pedestal.

▶ **Old Proposals**—Like most other aviation regulations, the new cockpit standards requirement was not adopted without its share of pulling and hauling between industry and the regulatory agencies.

One previous attempt at cockpit standardization by CAB was tailored after a single-seat fighter cockpit and was received with considerable disdain by the transport aircraft industry engineers, who already were working on the SAE proposals.

▶ **Propeller Controls**—The new requirements provide for location of propeller speed and pitch controls at the right of the pilot's throttle and at least one inch lower than throttle controls.

They also specify that a means be provided to indicate to the pilot when a propeller is in reverse pitch.

▶ **Ditching Design**—Probably next in importance to the control standardization among new transport airworthiness requirements are changes in aircraft design and equipment installation requirements for ditching certification. Compliance with these requirements is necessary only if the aircraft is to be used in overwater flight.

One of these changes says "it shall be shown that under reasonably probable water condition the flotation time and trim of the airplane will permit all occupants to leave the airplane and occupy the life rafts." Buoyancy value of fuel tanks which can jettison gas is taken into account.

Probable behavior of an airplane during a water landing shall be investigated by model tests or comparison with aircraft of similar configuration for which ditching characteristics are known, the regulation provides.

▶ **Ventilation**—Another step in solving human engineering problems is a new requirement giving the crew independent control of temperature and quantity of ventilation in their compartment. This is a regulation that Air Line Pilots Assn. has campaigned for with data showing the effects of inadequate cockpit ventilation on pilot efficiency.

▶ **Powerplant Tests**—Industry argument prevailed in the airworthiness discussion last August over changing endurance test requirements for aircraft piston powerplants (AVIATION WEEK Aug. 11, p. 46).

In its new powerplant regulation the Board has kept the endurance test at 150 hr., instead of stepping up to 200 hr. But CAB has followed the industry proposal to vary speeds at which the test is run for a more complete picture of the engine's operational capabilities. Separate test runs are prescribed for single- and two-speed engines and helicopter powerplants.

▶ **Exterior Lighting**—A special Regulation SR-392 permits continued experimentation on improving position light and anti-collision light systems by airplane operators on a limited number of aircraft up to June 30, 1955, with permission of the administrator. (Several carriers, including American Airlines and United Air Lines already have indicated they are adopting as standard the Grimes anti-collision G-570 revolving red light installed at the top of the tailfin of aircraft (AVIATION WEEK Apr. 20, p. 16).

Meanwhile, new Section 4B-637 authorizes the installation of an anti-collision rotating beacon on top of the fuselage or tail, and an explanatory note from the Board points out this is intended to provide a standard broad enough to include substantially all the existing anti-collision light installations, while permitting further experimentation.

▶ **Helicopter Changes**—A series of amendments to Civil Air Regulation Part 6 includes a fuel requirement that helicopters carry sufficient fuel for at least one-hour operation at maximum continuous power and rpm. (Effect of this requirement on jet rotor helicopters, some with notably short duration, will be studied by industry.)

Other new helicopter provisions permit the manufacturer to assume rotor lift equal to at least half the design maximum gross weight in structural tests involving landing impact loads. They also require additional provision for isolating powerplant fires to assure

that a controlled auto-rotational landing can be made within five minutes after an engine blaze starts.

The new airworthiness requirements also include:

• **Fire protection.** Additional fire protection for powerplants is required in Sections 4B.401, 4B.484 and 4B.487 amendments. Newly certificated airplanes must install a fire extinguisher in the Engine Zone 1 and fireproof nacelle skin in Engine Zone 3. Airplanes manufactured after June 30, 1954 must have fire-resistant lines in propeller feathering systems and either the fire extinguishers in Zone 1 or the fireproof nacelle skin in Zone 3.

• **Aircraft weight.** Amendment of Part 3 dealing with non-transport aircraft in normal, utility and acrobatic categories limits its applicability to planes weighing a maximum of 12,500 lb. or less and eliminates flight manual requirements for airplanes of 6,000 lb. or less. However, comparable information is required to be provided in placards, markings or manuals.

• **Inspection procedure.** Aircraft manufacturers not holding Civil Aeronautics Administration production certificates are required by an amendment to Part 1 to establish approved production inspection systems for their products within six months after issuance of type certification for it. This amendment also delegates inspection responsibilities to manufacturers for certificated products.

Industry spokesmen took a dim view of this amendment in its proposal stage last fall as an attempt by CAA to force all manufacturers to get production certificates, issued on a voluntary basis heretofore.

Let Investors Share Air Profits: Damon

Just about everyone connected with air transport except the investors is reaping benefits of aviation progress, Ralph S. Damon, president of Trans World Airlines, says. And if government policies that hold down airline profits do not change, the carriers will be hampered when they try to buy new, better equipment.

Damon says air progress the last 15 years has benefited:

• **The public,** which gets faster, cheaper service.

• **The government,** which now has available the "finest system of air transportation in the world" for postal service, commerce and defense. Two hundred and ninety-four planes of a total

BIG COPTERS IN ACTION

Shown in flight are the new Navy Bell XHSL-1 (above) and the Air Force Piasecki YH-21 (left). This view of the XHSL-1, taken on its first flight, shows the mounting of its P&WA R2800 engine behind the cabin and details of the rear rotor. It is Bell's first tandem rotor model and is designed to carry considerable avionics gear to locate enemy subs. The Piasecki YH-21 Work Horse is seen demonstrating its "flying crane" abilities by airlifting a 2,200-lb. Army Signal Corps communications hut slung beneath the fuselage. This load-carrying factor was demonstrated to the public for the first time during recent celebration of the company's 10th anniversary of the initial flight of a Piasecki copter, the single-seat, single-rotor PV-2 on Apr. 11, 1943. The YH-21 is the largest U. S. helicopter in production, can carry 12 litters. Speed exceeds 140 mph.

commercial fleet of 650 modern four-engine transports have been assigned to the U. S. Civil Air Reserve.

• **Airline employes,** who have shared in improved wages, job security, pension plans and other benefits.

Only the investors lag, Damon says.

TWA cleared $13 million before taxes on a gross of $112 million on its transcontinental routes in 1952, with a non-subsidy mail rate. For the same period, its International Division posted $300,000 profit before taxes on a gross of more than $48 million. The airline president says the low profit on international operations resulted from CAB's sharp cut of temporary mail rates for the division. He hoped that CAB's present "unrealistic view" would be changed.

▶ **No Jets Yet**—Damon told the Aviation Writers Assn. in New York this month he would like to see U.S. manufacturers and airlines overcome Britain's jet lead in a sound businesslike fashion, without government subsidy. This would be possible if government permitted industry to retain a larger share of its earnings. But if there is no other way for the U.S. to develop jet transports, Damon indicated he would accept government support, although reluctantly.

Looking into the future, Damon says TWA is not ready to go into either turbojet or turboprop operations. He is pessimistic about the ability of jet transports to operate at a profit in the next few years. "It will probably be eight years before we see jet transports in more than token service," Damon said, "unless political considerations keep them going."

On purely economic grounds, he thinks early contenders, including the Comet 3 and other designs now on the boards, will fall by the wayside. High fuel consumption of jet planes would prevent their economical operation.

▶ **Turbine Race**—Damon expects jet transports to be limited to longhaul, high-density routes for some time to come, except where "political considerations" apply.

TWA is watching with interest British European Airways' service with turboprop Viscounts. For the time being, however, Damon's line is not making any decision between turbojets and turboprops. "We're waiting to see which horse wins the race," Damon says.

Fred Lee Approved

Senate Interstate and Foreign Commerce Committee last week unanimously approved the nomination of Fred Lee as Civil Aeronautics Administrator and Senate confirmation appeared assured.

NEW ASSAULT TRANSPORT, the Chase C-123B, carries 61 fully equipped troops.

New Chase Carrier Makes Debut

By Henry Lefer

West Trenton, N. J.—The multi-purpose Chase Aircraft C-123B assault transport made its first public flights here last week before U. S. and foreign military observers and the press. Maj. Gen. Homer L. Sanders of the Tactical Air Command, Langley Field, Va., where the first C-123Bs will be assigned, was among the spectators.

Infantry troops from Fort Dix and National Guard mobile units helped demonstrate fast loading and unloading capabilities. The plane is designed to carry 61 fully equipped infantry troops. In demonstration, 62 infantrymen trotted under the C-123B's sharply rising tail, up the power-operated ramp and into its 3,570-cu. ft. belly. In approximately one minute the troops were inside and seated. Unloading was just as fast. Field artillery and trucks were quickly loaded and unloaded.

▶ **Stiff Fight**—Fighting a stiff wind, Chase chief test pilot Robert M. Hawley demonstrated the plane can take off and land within 1,000 ft.

This wasn't the first fight the Avitruc series had faced. At Eglin Field, Fla., the XC-123 came out on top in USAF's rugged assault transport evaluation in 1950, besting the Fairchild C-82 Packet (stripped down) and the Northrop C-125 Raider. Chase's YC-122 was second.

In the Mercer Airport demonstrations last week, the C-123B was flying light and using paved runways. But its short-field characteristics still were apparent. The transport is designed to take off and land over a 50-ft. obstacle in 1,180 ft. and 930 ft., respectively, at its combat gross.

▶ **Roomy Inside**—The interior of the plane is relatively uncluttered, with a row of canvas-and-steel-tubing seats along each wall and a line of back-to-back seats down the middle.

Cargo loading is simplified by the ramp, rising about 2¼ ft. to the cargo deck's floor. Tie-down rings, set on a 20-in. grid pattern, can take 10,000-lb. loads.

For hospital use, the plane can carry 50 litter patients, six ambulatory patients and six medical attendants. Chase engineers say the conversion from assault or cargo transport to ambulance plane takes just a few minutes, with necessary equipment self-contained.

▶ **International Interest**—Foreign interest in USAF's new assault transport is warm, according to Michael Stroukoff, founder and chief engineer of Chase, who says Turkey is ready to place an order for 18 planes. USAF has approved, but Stroukoff is holding off until construction is underway on Chase's new $2-million plant at Mercer Airport and he can quote reasonably firm delivery dates.

France, India and Australia also are interested in the C-123B, Stroukoff says. Australia's air attache in Washington, Group Capt. Deryck Kingwell, told AVIATION WEEK the plane's short landing and takeoff runs had proved impressive.

▶ **Chase and Kaiser**—Air Force has ordered a "very substantial" number of C-123Bs for Tactical Air Command and the Army. First production C-123B was built at West Trenton, but remainder of the AF order is scheduled for Kaiser-Frazer's Willow Run plant. (Kaiser obtained a 49% interest in Chase in the merger of the two companies last May. Stroukoff retains the controlling 51%.)

Chase, although holding the prime contract, will act as a subcontractor, supplying sub-assemblies for Willow Run. First Willow Run C-123B is expected

off the line in June. It is planned to fill foreign orders and any possible civilian orders for the transport at Chase's new West Trenton plant.

▶**Homing Radar**—The C-123B carries APN-12 radar for homing into unimproved combat fields. It is equipped for both wingtanks and tiptanks to extend its range. Crew normally will be pilot and co-pilot-navigator.

Fuselage of the production version differs from the prototype in that the tail has been made higher and squared off at the top.

In addition to the ramp, the C-123B has four side doors for emergency exit. The cockpit, reached by a ladder from the cabin, is raised and backed by a sturdy bulkhead to protect its occupants in case of cargo shifting.

The C-123B can operate as a towplane, pulling a 30,000-lb. glider, or it may be towed, with or without engine nacelles. The prototype fuselage is claimed to be the first ever to be used as a glider, piston plane or jet plane with no change except in powerplants.

▶**Specifications**—The C-123B is designed to cruise at 205 mph., land at 85 mph. Top speed is given as 245 mph. and stalling speed as 75 mph. Sea level rate of climb is 1,250 fpm.

Combat range, with nacelle tanks only, is 2,050 mi.; normal and ferry range, with nacelle and wing tanks, is given as 3,230 mi.

Design gross weight is 53,200 lb., including a useful load of 23,200 lb.; maximum gross is 71,000 lb., with a useful load of 41,200 lb.

Wingspan is 110 ft., length 75 ft. 9 in., height to fintip 34 ft. 1 in., wing loading 43.5 lb. per sq. ft. The cargo compartment is approximately 8 ft. high by 9 ft. wide by 37 ft. long. Usable floor area is 450 sq. ft.

The C-123B is powered by two Pratt & Whitney R2800-99W engines delivering 1,900 hp. at 2,600 rpm. (rated) and up to 2,500 hp. at takeoff (with water injection). Propellers are Hamilton Standard three-blade, constant-speed, full-feathering, reversible dural blades, with 15.5-ft. diameter.

Landing gear is tricycle-type, retracting.

House Committee Cuts NACA Budget

Following recommendations of the new Administration, House Appropriations Committee cut $10 million from the fiscal 1954 budget of National Advisory Committee for Aeronautics for new facilities.

The slash eliminated three projects from the Truman budget (AVIATION WEEK Apr. 13, p. 15): $8,514,190 for rocket engine research facility at the Lewis Laboratory; $1,370,700 for a variable Mach number nozzle for a 4x4-ft. supersonic tunnel at Langley Laboratory, and $179,000 for an alteration of the test section of supersonic free-flight tunnel at Ames Laboratory.

The committee allowed $52.9 million for NACA operations, compared with $58 million proposed in the Truman budget and $53 million recommended by the new Administration. This would enable NACA to increase its personnel by approximately 230 in fiscal 1954 to operate new facilities, but it would not allow for increased operations of present facilities as in the Truman budget.

The House committee allowed funds for these projects:

• **Langley Laboratory.** High-temperature structural research laboratory, $4,153,000; boundary-layer control system for 8-ft. transonic tunnel, $1,236,200; 20-in. variable Mach number facility, $1,772,490; increased capacity for Stratton Road substation, $226,600.

• **Wallops Station.** Replacement of preflight jet heat accumulator, $310,000.

• **Ames Laboratory.** Extension of speed range of 1x3-ft. transonic tunnel, $990,700.

CAA Ends Freeze On '53 Airport Funds

Civil Aeronautics Administration has released 63 federal-aid airport projects from the construction freeze imposed early in February by the Budget Bureau.

The 63 projects all are part of the fiscal 1953 airport program, for which $5.5 million was appropriated by the 82nd Congress. An additional 37 fiscal 1953 projects still are under scrutiny by CAA.

There has been no change in CAA and Commerce Department policy on the fiscal 1954 airport funds, which have been eliminated from the budget request pending a thorough re-evaluation of the airport program (AVIATION WEEK Apr. 20, p. 13).

CAB Studies Cutback Of Air Safety Staff

Civil Aeronautics Board members are considering a plan to close CAB's eight regional safety investigation offices, order the investigators back to Washington and reduce their number.

Some airline pilots say this would cripple seriously investigators' ability to reach a crash before curiosity-seekers trampled and removed important evidence. Advocates of the plan cite:

• **Cost saving.** Each regional office costs about $30,000 annually.

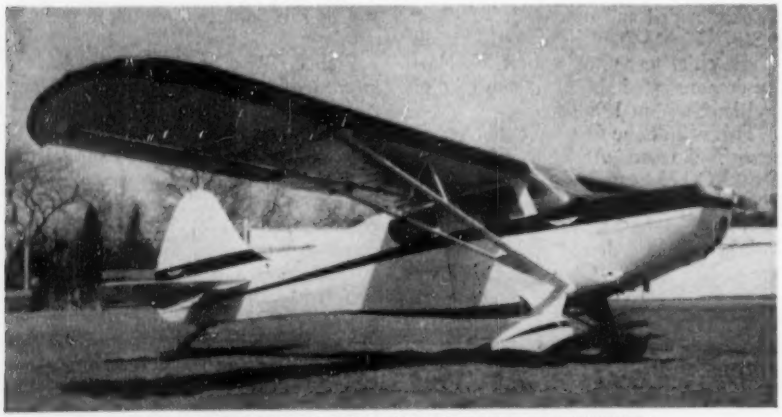
• **Accident prevention.** CAB could use money saved by the plan to hire technical experts to improve the Board's ability to investigate and regulate complex modern aircraft equipment and operations, another proponent says.

AF Gives 110 T-6Gs To National Guard

Air National Guard shortly will get 110 rebuilt T-6G training planes from the U. S. Air Force.

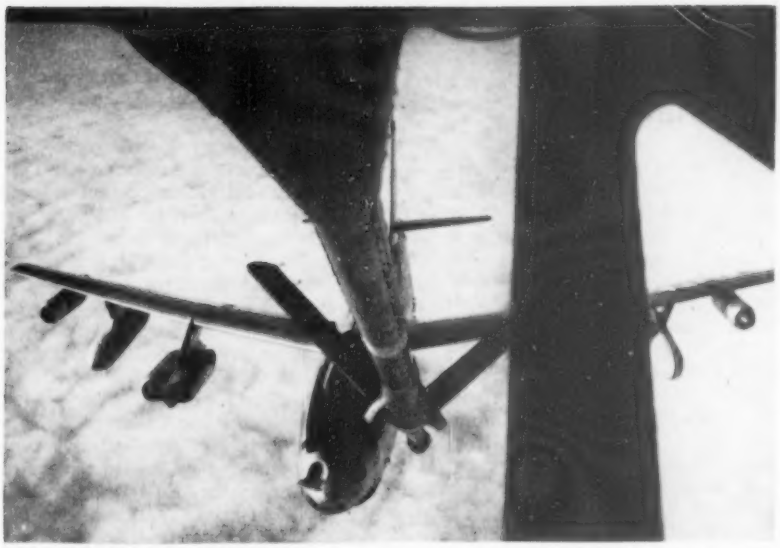
Maj. Gen. Earl T. Ricks, acting chief, National Guard Bureau of the Defense Department, says the two-seater trainer will be distributed to various Air Guard units as quickly as they are overhauled in North American Aviation shops.

With the addition of the T-6Gs, Air Guard will have about 470 planes for instrument and tactical training.



TAYLORCRAFT PRODUCES 1953 TOURIST

Here is the latest model four-place Taylorcraft Tourist to come off the production lines at Conway, Pa. Priced at $6,750 at the factory, the 1953 Tourist can be had with two, three of four cabin doors. Powerplant is a 145-hp. Continental C145-2H turning a metal McCauley propeller. Top speed is 125 mph., cruising speed 115 mph. Takeoff run is 500 ft. and initial climb is 700 fpm. Cruising range is 500 mi., weight 2,200 lb.



MANEUVERING for air-to-air fuel hookup, B-47B creeps up on KC-97 tanker boom.

CONTACT MADE, Stratojet quenches its thirst. Note receiver receptacle cover open.

DUMMY BOMBS for B-47 are used as perch by crew members who flew on the test.

B-47 Workout

- **Stratojet, aided by jet stream, hits 794 mph.**
- **Bombs from 40,000 ft. during 1,000-hr. trial.**

A Boeing B-47B Stratojet medium bomber attained a ground speed of 794 mph. during a 1,000-hr. accelerated tactical test program conducted by Boeing Airplane Co.'s Wichita, Kan., Division under an Air Force contract.

The phenomenal speed was recorded when the Stratojet's pilot maneuvered into a jet stream at 40,000 ft. while flying from Albuquerque, N. M., toward his Wichita base. On another mission, a nonstop flight from Wichita to the East Coast and return, the B-47 used a jet stream again to cover the 725 statute miles in exactly 65 min. for an average ground speed of 659 mph.

During the shakedown the B-47 made 121 flights and covered more than 432,000 mi. under simulated combat conditions which included carrying loads of 1,000-lb. bombs.

▶ **Simulated Battle**—Missions averaged 8½ hr. each, although many lasted 12 to 13 hr. Longest time spent in the air by the 185,000-lb. six-jet bomber was 14 hr. 25 min. Nearly half the missions were flown at night and the plane was refueled in the air (see pictures) by a Boeing KC-97 Stratofreighter 69 times during the day and after dark.

During its strenuous workout over 39 states, the Stratojet frequently became a target for interceptors, and on one trip while 36,000 ft. over Florida was tagged by lightning which punched four or five small holes in the plane. Although severe turbulence was encountered during this latter experience, the B-47's flexible wings smoothed out the ride through the thunderstorm.

Simulated bombing raids using radar were carried out on principal cities in California, Oregon, Ohio and Florida. On a dozen of these "raids," dummy bombs actually were dropped on the Eglin AFB bombing range in the Gulf of Mexico. Drops were made from 40,000 ft. and higher.

▶ **Log 1,000 Hr.**—Individual missions were flown to Lowry AFB, Denver, Colo., and MacDill AFB., Tampa, Fla., but otherwise the Stratojet took off and landed at Wichita, except once when the plane used Tulsa, Okla., as an alternate when Wichita was closed in.

Boeing project pilot Ed Bracher and Ed Hartz, supervisor of production flight test activities, were pilot mainstays during the 1,000-hr. program, during which they became the first flyers to log 1,000 hr. exclusively on the B-47.

Bell Demonstrates New Model 47G

Synchronized elevator and hydraulic control boost added to improve craft's flight characteristics.

New Bell H-13G helicopters, incorporating major basic control and rotor blade improvements over earlier models and one-third increase in fuel capacity, are scheduled to be delivered in June to Air Force and Army.

Joe Mashman, Bell sales engineer-pilot, has been demonstrating the prototype, a Model 47G, to the Navy and Coast Guard. A certificated version will be marketed to civilians.

▶ **Increased CG Travel**—Control fore-and-aft has been improved by installation of a synchronized elevator which works with the tilt of the rotor and increases the copter's permissible center-of-gravity travel by 40%. The Model 47G has a 7-in. CG travel, greater than in any helicopter of comparable size or even in some much larger, Bell reports.

The elevator is a small metal airfoil with circular end plates of about 8-in. diameter. Elevator has about 3½-ft. span and about 12-in. chord. It is attached at right angles to the tail-boom structure, approximately two-thirds of the distance out from the engine.

▶ **Power Control**—The synchronized elevator and a low-pressure hydraulic power control system, making possible hands-off flight, and other modifications were installed as a result of service recommendation from Army operations of early Bell Model 47 copters in Korea.

▶ **Two Hours Hands-off**—Testing the aircraft's improved control, Mashman and Bob Duppstadt, project engineer, recently flew the prototype 47G hands-off in a two-hour run from Alexandria, La., to New Orleans after trimming it out, controlling it merely by shifting their bodies in the cockpit.

The power control was also used, although it was not generally known at the time, on the Bell 47's recent record endurance flight. Mashman reported that the new machine is so much easier to handle for long periods that he recently flew it from Ft. Worth to Atlanta in one day in approximately 10 hr. 30 min. flying time.

▶ **Trim Limits**—In gusty air the helicopter will hold the speed for which it is trimmed within plus or minus 7-8 mph. and in smooth air, within 2-4 mph., Mashman says.

A bungee centering device is used with a regular fighter control stick button. The button applies a pressure gradient hydraulically to trim the craft to fly in whatever attitude the stick is moved.

Army pilots who have tried the new control system say that they expect it will greatly ease the transition from fixed-wing to helicopter flying because the heavy friction forces on the stick are overcome and the controls have a feel more like fixed-wing controls.

▶ **New Blades**—New high-lift main rotor blades give the improved machine approximately 200 fpm. more climb, Mashman says. A simplified all-metal tail rotor under development and test for the last three years also is incorporated.

Improved fuel system increases range from 2 hours to 3½ hours. Fuel is stored in 20-gal. twin tanks above the engine mount on each side, as close to the center of gravity as possible. Tanks are interconnected so that both can be filled from one side and so that the quantity in either tank will never differ by more than two gallons from the other.

▶ **Weight Saving**—It was necessary to shift the earlier Model 47 battery as a balance under various loading conditions. Now CG characteristics are so much better that this is no longer necessary.

A larger capacity battery is fixed in an aft position, to balance the radio installation. This eliminates tail ballast, saving approximately 12 lb.

Other modifications include:

- **Installation** of a heavy-duty 50-amp. generator and regulator replacing the old 25-amp. generator.
- **Remounting** cockpit Plexiglas bubble to allow better expansion space for temperature changes.
- **Seven-pound weight saving** using new lightweight seat cushions.
- **Approximately** 10% more pitch control is obtained with the same pressure of the anti-torque pedals by use of a smaller diameter tail rotor control cable drum which results in more powerful anti-torque correction. This is structurally permissible with new all-metal tail rotor blades.

STARFIRE POPS BRAKING 'CHUTE

With its 16-ft. deceleration chute open to slow its landing roll, a Lockheed F-94C all-rocket-armed two-seat jet intercepter lands at a California base. The parachute is stowed in a compartment above the tail-pipe. The all-weather Starfire is the first U. S. production fighter to utilize a parachute braking device. This F-94C appears to have a more streamlined nose radome than previous Starfires.

MATS Increasing Payload of C-124s

Military Air Transport Service is increasing payload of its Douglas C-124 Globemaster by about 1,500 lb. by removing seldom-used equipment. The modification project is slated for completion by the end of this month.

Equipment removed includes:

- **Troop oxygen system,** 1,300 lb.
- **50-gal. water tank,** 90 lb. for tank and supporting structure (tank full of water would weigh about 500 lb.).
- **Portable oxygen** bottles, 24 lb.
- **Hot cups,** 10 lb.
- **Passenger buffet,** 80 lb. (from the few C-124s so-equipped).

A MATS spokesman said that when carrying troops, the C-124 normally cruises at only about 10,000 ft. Air Force ordered the C-124 design primarily as a specialized bulky-cargo carrier and for use as an all-purpose transport.

The new weight-stripping project may indicate that the so-called "airline economy" faction in MATS management has won a point over those who consider its primary mission as training and standby preparedness for special military service.

Jet Runway at Vancouver

A new 8,600-ft. runway designed to handle trans-Pacific jet transport operations is in operation at Vancouver, B. C., International Airport. The 200-ft. wide runway was financed by the Canadian government through Department of Transport at a cost of nearly $2¼ million.

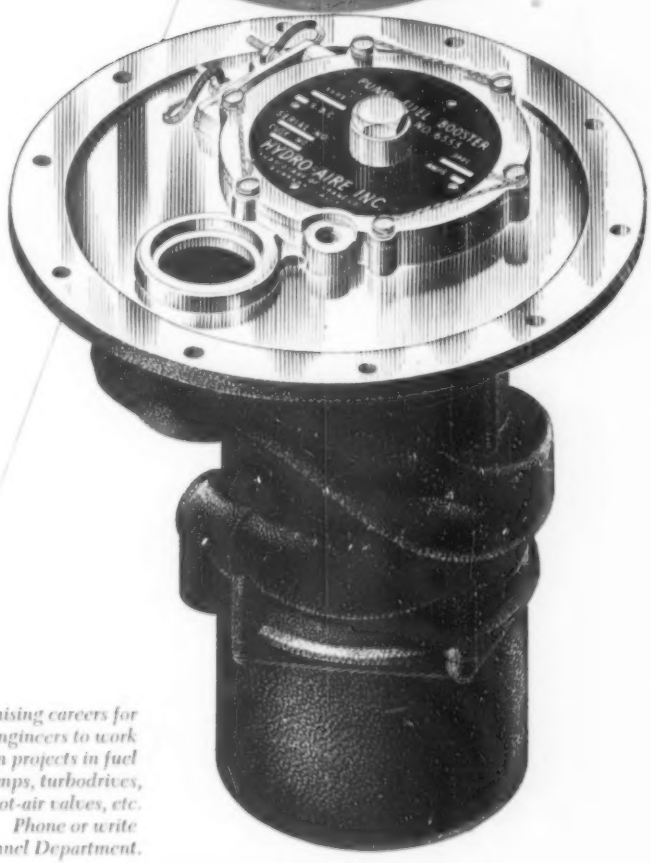
never an ornery attitude ...even when you hit the ceiling!

Another outstanding development from HYDRO-AIRE RESEARCH the HY-$^{V}/_{L}$* fuel booster pump!

The elimination of inherent vapor-stall characteristics has long been an objective of Fuel Booster Pump Engineering. As a result of years of research and testing by Hydro-Aire an entirely new principle was applied which resulted *in vapor being forced into the fluid* rather than the vapor being *separated* from the fluid. Here was the answer to the problem. The result—Hydro-Aire's HY-$^{V}/_{L}$ Fuel Booster Pump which today is delivering unequaled operating efficiency even when subjected to ultra-high altitude operations.

Proof again that at Hydro-Aire, there are *few* projects too large...*no* project too small. Whatever your problem—complicated as a Fuel Booster Pump or simple as a Check Valve—call your Hydro-Aire Field Engineer.

*Vapor-liquid ratio



Promising careers for Engineers to work on projects in fuel pumps, turbodrives, hot-air valves, etc. Phone or write Personnel Department.

Every fighter, every bomber, every transport is HYDRO-AIRE *equipped!*

Inc.

SUBSIDIARY OF CRANE CO., BURBANK, CALIF.

Application of RADIUM,
FLUORESCENT and PHOSPHORESCENT LUMINOUS MATERIALS

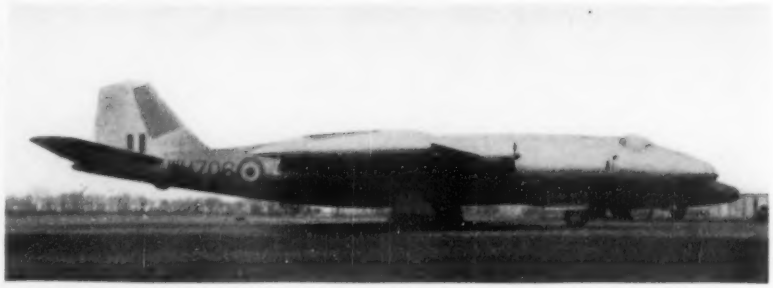
GOVERNMENT APPROVED...

FROM BLUEPRINT TO FINISHED PRODUCT!

Sampson has complete facilities to furnish all necessary parts or will work from parts supplied. Dials, knobs, pointers etc. produced to accurate tolerances and processed with standard instrument finishes. Figures and calibrations can be applied with luminous or non-luminous materials according to your requirements. SAMPSON produces large scale orders as well as orders for "one-of-a-kind."

SEND BLUEPRINTS FOR QUOTATION!

SAMPSON
CHEMICAL & PIGMENT CORP.
2834 W. Lake St., Chicago 12, Ill.
WRITE FOR DESCRIPTIVE BROCHURE!



CANBERRA'S high-altitude capability made effective fighter interception difficult.

Flying a Jet Bomber in 'Combat'

What is it like to fly on a jet bomber sortie at 40,000 ft. plus? Derek Wood, member of RAF's recognition outfit, gave AVIATION WEEK *these impressions after flying in an English Electric Canberra during the recent NATO-RAF Bomber Command's Exercise Jungle King.*

RAF Bomber Command Base, Lincolnshire—The first requirement for passengers going on a Canberra bombing sortie is to pass a stiff physical. My lungs, heart, blood pressure and ears were checked and I spent one-and-a-half hours in a decompression chamber going up to 37,000 ft. simulated altitude.

Over this hurdle, I was issued a flying kit plus warm sweater, an extra pair of socks and a pressure vest interconnected to an oxygen mask. This vest can be used to raise the ambient pressure of the lungs in event of pressurization failure.

▶ **Briefing**—At a post-breakfast briefing we learned our mission. For Operation Jungle King it was assumed that the enemy was attacking westward through Germany; that he had been checked in the north; and that pressure on forces defending the southern salient was to be eased by providing tactical bombing support. Our target was an airfield near Stuttgart, Germany.

The usual navigation, weather and air traffic control briefings were given. A significant new figure, the Radar Leader, detailed the techniques to be used.

Normally the Canberra carries a navigator and a navigator/bombardier seated side by side aft of the pilot. The bombardier crawls under the instrument panel and assumes a prone position in the nose cap. I was strapped in a makeshift seat next to the pilot, leaving the bombardier's ejection seat empty.

We took off using only a short length of the runway and climbed steeply through clouds with a 200 ft. base. By the time we had gone some 55 mi. we were in bright sunshine at 40,000 ft. and still climbing. The pressure control valve automatically maintains correct cockpit pressurization above 10,000 ft. with a hot-and-cold air mixture bled from the plane's Rolls-Royce Avon compressors. Cabin pressure at 40,000 ft. was kept at an equivalent of 25,000 ft.

▶ **Canberra Cockpit**—When the sun is not shining inside the cockpit, and particularly at night, it gets extremely cold; down to 32 deg. inside and −62 deg. F outside. The sun's glare is tiresome if tinted glasses are not worn as there is no dust or moisture. Overhead, the sky is almost black, lightening to a whitish-blue on the horizon.

In the cockpit there was only a slight hum from the Avons and no vibration—in fact at this altitude there is no sense of movement, just a curious feeling of hanging in space. Pilot's view is excellent ahead and above. Slight aileron movement gives him uninterrupted downward view. His seat is slightly offset from the center of the plane to improve vision.

In the Canberra's cockpit, forward of the "spectacle"-topped control column, is the blind flying panel with Machmeter on the port side. On the pilot's left is the control console and on the starboard side are the engine instruments.

The blown canopy is of sandwich construction with VHF aerials suppressed in both sides. Dry air de-misting is employed, but a small patch of ice formed during this flight in the top of the canopy between the layers of transparent material.

▶ **Fighter Interception**—We proceeded at well over 40,000 ft. by way of Brussels, Luxembourg and Strasbourg. Until then, there had been no sign of fighter interception which was supposed to be supplied by Allied Air Forces Central Europe. But then after we had descended slightly (remaining above 40,000 ft.) 60 mi. northwest of Strasbourg, three F-86 Sabres appeared turning in at 9 o'clock. Their turning circle seemed to be too great and they

passed by astern. Several other Sabres then attempted a head-on attack but had insufficient altitude and shot by beneath us.

No tail warning radar was fitted to this particular Canberra and when we were at last "shot down" a few moments later, our first indication of the attack came when four Canadian Sabres flashed past from behind and broke away above and below.

Despite the interruption the run to the target continued, and in lieu of bombs, a picture was taken of the airfield. Climbing back to normal height (security will not permit the figure to be revealed) a course was set for home.

▶**GCA Landing**—Thick clouds obscured the airfield so we descended rapidly from 30,000 ft. to 2,000 ft. in five minutes and made an excellent GCA landing as part of a stream of planes. The two-and-a-half-hour flight had covered just under 1,000 mi.

We had relied on radar navigation during the entire trip except for a brief period when certain ground transmitter signals were too faint to be reliable. No snags had been encountered with any of the equipment or engines.

Outstanding feature of the trip had been the ease with which the Canberra handled at all altitudes from sea level to well over 40,000 ft. The flight had been akin to riding low down with a lightly loaded, powerful fighter. This is accounted for by the Canberra's clean design, wing loading less than 50 lb./sq. ft. and special spring tab devices.

▶**Nine-Mile Ceiling**—The Air Ministry still officially gives the Canberra's ceiling as "above 40,000 ft.," although government spokesmen have stated that it is over nine miles. At its true altitude it is doubtful if any Western fighter, including the Sabre, can get at it. To add realism to bomber and fighter exercises, Canberras have been ordered to operate at fighter level and not to maneuver or climb away. Even under these handicaps interceptions are the exception rather than the rule.

Squadrons operating Canberras are confident that they can meet any fighter opposition by climbing, maneuvering or turning into the fighters as they approach from around three or nine o'clock. The Canberra is known to be faster than the Meteor and have a greater rate of climb than the Sabre. More than 100 Canberras are in service.

▶**New Bombing System**—Major setback with the Canberra was the lack of new-type radar for the solid-nose Mk. 1, necessitating a redesign as a three-seater with a bombardier's nose panel. This has been corrected on the B. Mk. 2 with perfection of a new blind bombing system that replaces old target marking methods. Thus the Canberra can pinpoint its targets accurately in any weather or at night. The new system was used in Exercise Jungle King and in the final attack on the Nordhorn bombing range Mar. 21, when the largest single force of Canberras ever operated attacked with practice bombs, hitting the target through 8/8th cloud. The planes bombed at two-minute intervals for approximately two hours.

▶**Bomb Problem**—Greatest problem in high-altitude bombing brought to light using the Canberra (a universal problem not restricted to any one type) is the large margin of error possible using ordinary bombs.

As Air Chief Marshal Sir Hugh Lloyd

60,000 Ft. Up

A special English Electric Canberra, powered by more powerful Bristol Olympus split-compressor turbojets has attained altitudes exceeding 60,000 ft. The official world's altitude record, made in a special de Havilland Vampire (DH Ghost) stands at 59,446 ft.

This particular Canberra is being used as a testbed for the flight development program on the Olympus engine, which is in the 10,000-lb. thrust class.

Microtomic

keeps pace with the world's fastest-moving industry

The Eberhard Faber Microtomic drawing pencil was designed to meet the specific needs of engineers and draftsmen of our swift-advancing aircraft industry.

In all 18 degrees, you'll find newly developed quality that assures absolute degree uniformity, plus an opaqueness that you've wanted for deep print clarity.

Microtomic represents the finest example of research in drawing pencils, designed to stand the most rigid drafting room comparisons. Test them today—sample on request (please specify degree wanted).

Only Microtomic gives you all these features

HI-DENSITY LEAD
Lines are opaque to actinic rays of high speed 'printers'.

ABSOLUTELY UNIFORM
Every Microtomic of the same degree marking is identical.

NEW DUSK GRAY
Scores of professional men acclaimed it the best color for a drawing pencil.

BULL'S-EYE DEGREE MARKING
Easier to read . . . quicker to find—positive identification.

ALSO—Choice of Holders and Microtomic Drawing Leads in all degrees.

EBERHARD FABER

since 1849

Air Strike....Submarine Style

Guided missiles launched from submarines promise to be major offensive weapons in case of war. A missile of this type travels to its distant destination under unerring electronic orders. The brain center for such missiles will be typical of the electronic systems developed and manufactured by Arma Corporation.

In close collaboration with the Armed Forces since 1918, and more recently with the Atomic Energy Commission, Arma has contributed much in basic research, design, development and manufacture to the advancement of electronic and electromechanical weapon control, navigation, and other precision remote control systems. There is every reason to believe that engineering background and techniques—first used successfully in these devices—will see widespread industrial applications. *Arma Corporation, Brooklyn, N. Y.; Mineola, N. Y. Subsidiary of American Bosch Corporation.*

ARMA ADVANCED ELECTRONICS FOR CONTROL

put it after Jungle King, "If Bomber Command had been asked 18 months ago to drop bombs from above 40,000 ft. at a speed of 450 knots, it would have been quite an achievement if they had fallen in the right county. Nowadays crews are bombing small ranges."

Much progress has been made and the size of bomb carried by the Canberra has been steadily increased. Full use cannot be made of the plane's load-carrying capabilities until the guided bomb, being developed in England and at Woomera, Australia, has been perfected.

▶ **Valuable Experience** — Experience gained in operating Canberras, which bring up problems in lubrication, electrical insulation, radar, radio, bomb-door opening and so forth is being incorporated in the newer Vickers Valiant, Handley Page Victor and Avro Vulcan now in production for the Royal Air Force.

The techniques to be used on these newer, heavier types are being passed on to Canberra crews who will form the nucleus of an atomic-bomb equipped strategic force.

Due to the complexity, size and cost of these later aircraft they will not be built in quantity and for a long time to come the Canberra will make up the tactical backbone of the Bomber Command.

Boeing Lists Salaries Of Top Executives

Boeing Airplane Co. paid its president, William M. Allen, $86,940 in salary and incentive compensation during 1952, the company has reported to Securities & Exchange Commission. Boeing paid all its directors and officers $493,165 during 1952. Figures include awards made in 1952 under the company incentive compensation plan relating to 1951.

Wellwood E. Beall, senior vice president, received $59,805; Fred P. Laudan, vice president in charge of manufacturing, $39,815; J. E. Schaefer, vice president and general manager of the Wichita Division, $39,815; Edward C. Wells, vice president for engineering, $47,845; J. O. Yeasting, vice president and controller, $33,405.

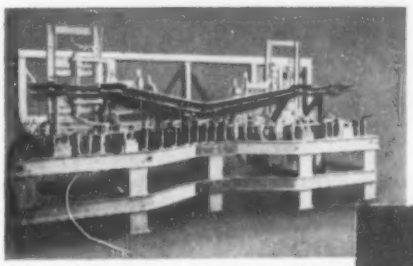
Boeing also paid $4,620.45 during the year to National City Bank of New York for services as registrar of the company's stock. National City Bank also received $162,752.21 total interest during the year on 1952 loans. Maximum amount of indebtedness of the company at any one time in 1952 was $10,600,000.

Of 1,622,254 shares of capital stock outstanding Feb. 1, 1953, 15% was owned by Merrill Lynch, Pierce, Fenner & Beane.

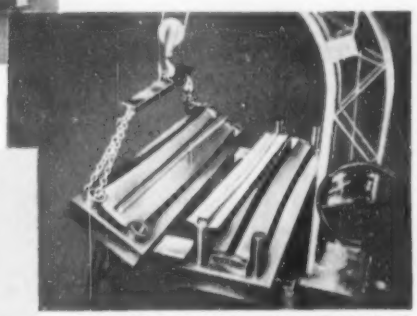
TWIX

for ALL aircraft tooling!

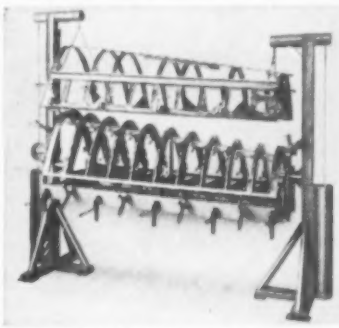
TWIX, with over twenty years in aircraft tooling, offers its Engineering staff, Experience and Manufacturing facilities for the development of your Tooling Program. One of the largest tool and die plants in the East, TWIX has produced tools, dies, jigs, and fixtures of *every type and size* to precision aircraft requirements and to the closest tolerances. TWIX services includes PROCESSING, coordination and tooling of parts, sub and complete assemblies — individually or collectively. *Staffed by Professional Engineers*



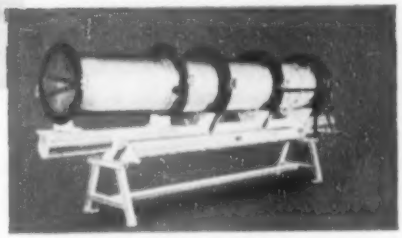
TWIX made Drill Jig & Locating Fixture: Drills the rivet holes and Locates and Holds all parts that make-up the Main Beam of the Aircraft. (Jig: 20' long X 6' wide X 10' high)



TWIX made Die to make a Hat-Sectioned Longeron in one operation. Longeron Dimensions: 72" long X 7" wide having Double Contour.



TWIX made tool for Routing, Drilling and Assembly of a Turtle Deck. (6' long, 4' high, 8' wide)



TWIX made tool for Locating, Welding and Riveting for assembly of Jet Tail Pipe. (20' long X 5' high X 3' diameter)

All Sizes
• Dies • Jigs • Fixtures
• Templates • Press Blocks • Dollies

Write, wire, phone for FACILITIES LIST & TWIX OPERATIONS FORMAT.

TWIX

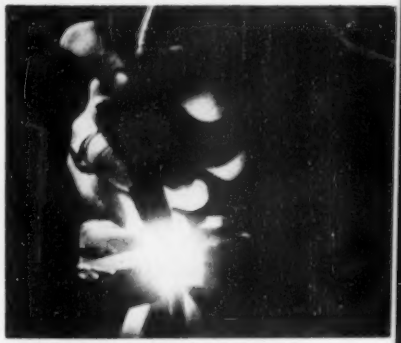
TWIX MANUFACTURING CO., INC. *Aircraft Tooling Division*
40-11 Twenty-first St., Long Island City 1, N. Y. STillwell 4-0530
SPECIALISTS IN AIRCRAFT TOOLING FOR OVER 20 YEARS

1878 75 1953
YEARS OF ELECTRICAL PROGRESS

FINAL INSTALLATION of new G-E thermocouple assembly on jet engine comes after ten manufacturing steps.

1. MAGNESIUM OXIDE is poured into thermocouples before ends are tamped and closed.

2. "SWAGING" PROCESS compacts magnesium oxide powder into a hard, solid electric insulator that withstands severe buffeting.



3. WELDING PROCESS joins chromel-alumel junction. It is this part of thermocouple which senses jet engine exhaust temperature.

4. X-RAYS OF EACH THERMOCOUPLE are taken from two angles to insure against weak spots that could cause short circuits.

What makes a great jet engine . . .

New G-E "Swaged" Thermocouple Assemblies Last Longer, Require Less Maintenance

G.E.'s new "swaged" magnesia thermocouple systems for averaging exhaust gas temperatures in jet engines, now offer longer operating life, less maintenance, and light weight.

- A complete G-E harness and thermocouple assembly weighs only 25 ounces—considerably less than most other systems designed for the same job.
- In actual flight tests, the G-E thermocouple system, ***without any maintenance,*** outlasted the operating life of the engine.
- Each thermocouple is installed by tightening a single lock nut to a boss. In replacing the harness, it is not necessary to remove clamps, or to unbraze joints.

What makes a great jet engine? The answer is quality component parts. Ask your nearest G-E Apparatus Sales Office for bulletin GEC-915, a descriptive booklet covering thermocouples, harnesses, and leads. If you wish, write *Section 210-71, General Electric Company, Schenectady 5, N. Y.*

You can put your confidence in—

GENERAL ELECTRIC

Cornell Center Sets up Targets

Progress in expanding aviation safety research has reached a point where there no longer are any serious gaps in fields being attacked by researchers, the third annual survey of the Daniel and Florence Guggenheim Aviation Safety Center at Cornell University reports.

However, the problem of getting available research data to aircraft designers and operators and into practical use still is serious. This particularly is the case, the survey finds, in the field of human engineering, where physiologists and psychologists already have amassed much useful data applicable to making aviation safer.

While the center has announced its campaign to "prod industry and the colleges into recognizing this important field," it points out that knowledge now available needs to be presented in a form more directly applicable to aviation problems.

▶ **Good Record**—The 1952 accidental death rate for domestic air carrier operations was the lowest yet achieved, 0.38 per 100-million passenger miles. It is an outstanding improvement over the 1.3 rate in 1951 and is lower than the last year (1951) reported for railroad passenger train fatalities, a rate of 0.43 per 100-million passenger miles.

But, international air transport fatalities increased to a rate of 3.1, compared to 1.1 the preceding year.

Nonscheduled air transport had a rate of 2.1, a sharp decrease from 7.1 in 1951.

▶ **Crash Protection**—Personal flying accident and death rates for 1951 and 1950 show only a limited improvement. There were 750 deaths in 1951, compared to 859 in 1950.

Data now is available on crash resistant features—such as strong seats, belts, shoulder harness and structural design features—that calls for more general application by the industry to reduce the hazards of transport flight.

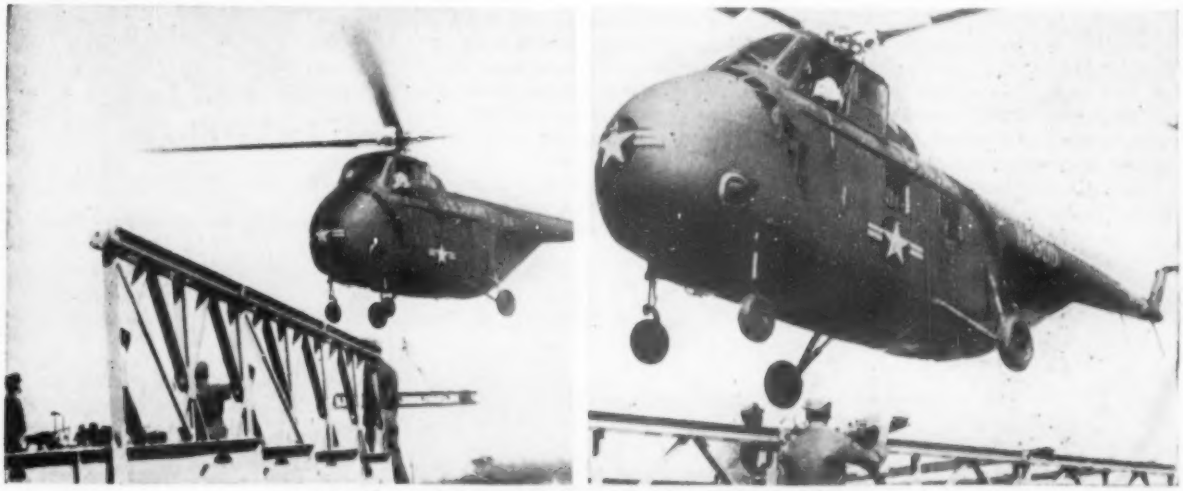
Navy reported operations of more than 500-million passenger miles by its Military Air Transport Service and other carrier squadrons without a fatality. No other Navy accident data, including carrier or other flight operations, was disclosed.

Air Force reduced non-combat accidents to 29 major crashes per 100,000 flight hours, compared to 33 in 1951 and 36 in 1950.

▶ **Effort and Money**—At a Washington meeting of center's foundation committee, chairman Harry F. Guggenheim said, "volume of air traffic is increasing so rapidly that only by an ever increasing effort and expenditure of huge sums of money in development and new equipment can we advance or even hold the safety gains we have made."

Specific safety recommendations made by the center:

- Research to reduce collision hazards and permit safe landings and takeoffs, studies made paramount by increasing speeds and more operation in marginal weather.
- Continuing projects for cockpit and ventilating system design to enable the crew to remain alert and operate more efficiently.
- Support of proposals for creation of an Institute of Civil Aviation Medicine. In contrast to the millions of dollars spent in engineering and operations research by government and industry, there is only one agency (Civil Aeronautics Administration) with limited personnel for the many problems of civil aviation medicine.
- Protection of plane occupants from crash loads applied in any direction. National Advisory Committee for Aeronautics is planning a series of dynamic tests on seats with varied directional loads in order to establish parameters for cabin and seat design.
- Further research and testing to improve facilities for evacuation from aircraft, due to crash fire hazards.
- Control of airplane fires by equipment carried in the aircraft.
- Industry attention to NACA and CAA studies on reducing fire ignition sources through fuel tanks designed to withstand crash decelerations and external tank installations, both for new designs and existing transports.
- Further research to correct external aircraft noise problems, indicating possible solutions before additional adverse public reaction forces the issue in a manner detrimental to the orderly development of aviation.
- Continued industry and government studies of aircraft components and the operational procedures used with them for accident prevention.
- Further research in equipment and crew training for emergency ditchings.
- Research leading to adoption of airborne radar for storm warning terrain clearance and collision avoidance for commercial as well as military aircraft.
- Attention to visibility, including

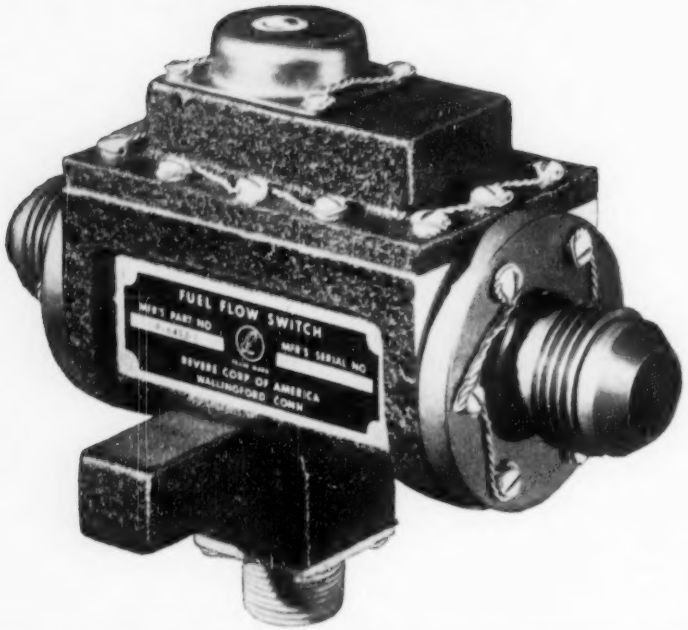


SIKORSKY H-19 COPTER HELPS BUILD BRIDGE

The versatile helicopter, in this case the Army's big Sikorsky H-19, is seen extending a helping hand in assembly of a Bailey Bridge at Fort Bragg, N. C. It is said to be the first time a copter has been used to put a Bailey Bridge together. In the photo, left, the H-19 is seen approaching the structure carrying a beam; while at right the craft has lowered the unit into place.

Revere

FUEL FLOW SWITCH



SIGNALS INSTANTANEOUS WARNING OF PUMP FAILURE

Specially designed by *Revere Corporation* for use in the main fuel pump line of the McDonnell F3H twin jet, carrier-based fighter, this precision instrument automatically signals warning of pump failure whenever flow falls below 1.0 gpm due to obstructions or mechanical breakdown. As flow diminishes, restoring and calibrating magnets force a pivoted aluminum vane toward a closed circuit position, actuating hermetically sealed magnetic switch. Increased flow automatically opens circuit. This unit is unaffected by altitude or other pressure and temperature changes. Primarily designed to indicate a rate of flow of non-corrosive liquids in aircraft, the **Revere Flow Switch** can serve industry wherever a pump failure warning system is desired.

For additional information send for **FREE** *bulletin # 1400.*

REVERE CORPORATION OF AMERICA
WALLINGFORD 2, CONNECTICUT, U.S.A.
another precision instrument for aircraft and industry

pushing the recently approved centerline approach lights system, as an aid to the pilot in landing.

Operating officers of the Guggenheim Center are Dr. T. P. Wright, chairman executive committee; Jerome Lederer, director, and R. M. Woodham, administrator. —AMcS

United Air Lines Plans Giant Loading Dock

An elaborate double-deck loading dock designed to speed passenger, baggage and cargo handling is being studied for initial installation by United Air Lines.

The dock is to be located at one end of a Whiting Loadair unit so that the aircraft could be easily towed to a nearby servicing area where it could be serviced with fuel and oil from hydraulically retractable stands. Other outlets would provide solvents, pneumatic air and electrical power. The layout would employ radiant heating to keep it free of snow and ice and would eliminate the need for many of present servicing vehicles required.

The passenger loading ramp would contain a waiting room, office, lavatories, storage space for cabin supplies and vacuum cleaner equipment. An area for pre-positioning meals prior to loading aboard the plane would also be included.

Although the airdock is still in the planning stage, according to D. F. Margarrell, UAL vice president-transportation services, it would simplify and accelerate many ramp activities. Airdock maintenance, he said, would be economical compared to purchase and upkeep of present ground equipment. Design of the unit was by J. D. Crichton, airport engineer at the carrier's Denver, Colo., operating base.

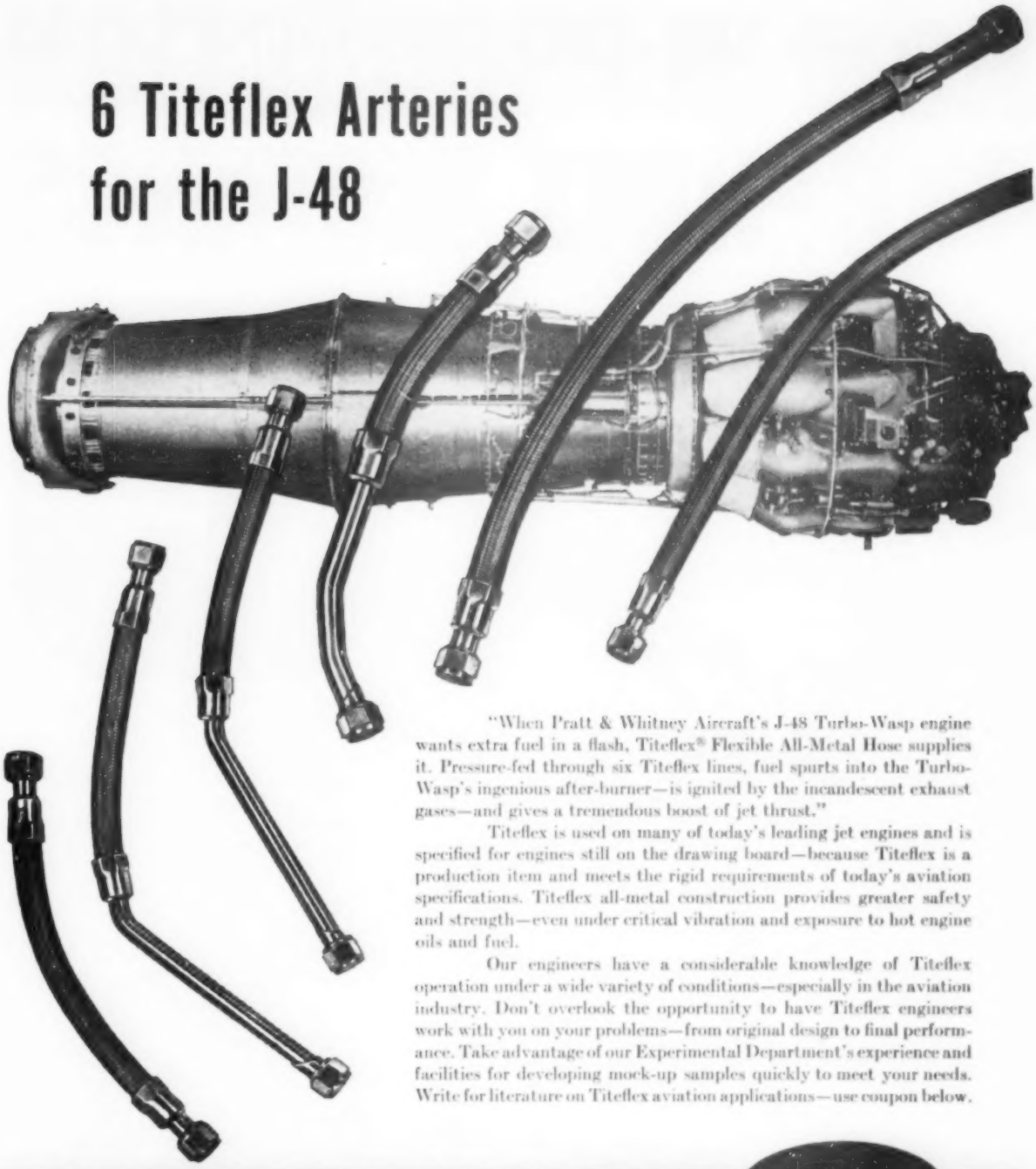
Ansett Fits Jets To DC-3 Fleet

(McGraw-Hill World News)

Melbourne—Ansett Airways plans to modify its DC-3s by fitting them with small French-designed Turbomeca gas turbine auxiliary powerplants to boost takeoff power. Installation of these engines will permit the carrier to extend the plane's fuselage 39 in. forward of the wings, thus making room for 36 seats and boosting gross weight some 1,500 lb. The planes now fly on a coach-only basis with 28 seats.

The Australian Federal Dept. of Civil Aviation is cooperating with Ansett and the Commonwealth Aeronautical Research Laboratories on the program. Results of tests will be made available to all Australian airlines.

6 Titeflex Arteries for the J-48



"When Pratt & Whitney Aircraft's J-48 Turbo-Wasp engine wants extra fuel in a flash, Titeflex® Flexible All-Metal Hose supplies it. Pressure-fed through six Titeflex lines, fuel spurts into the Turbo-Wasp's ingenious after-burner—is ignited by the incandescent exhaust gases—and gives a tremendous boost of jet thrust."

Titeflex is used on many of today's leading jet engines and is specified for engines still on the drawing board—because Titeflex is a production item and meets the rigid requirements of today's aviation specifications. Titeflex all-metal construction provides greater safety and strength—even under critical vibration and exposure to hot engine oils and fuel.

Our engineers have a considerable knowledge of Titeflex operation under a wide variety of conditions—especially in the aviation industry. Don't overlook the opportunity to have Titeflex engineers work with you on your problems—from original design to final performance. Take advantage of our Experimental Department's experience and facilities for developing mock-up samples quickly to meet your needs. Write for literature on Titeflex aviation applications—use coupon below.

Let Our Family of Products Help Yours

Titeflex

✓ Check products you are interested in.

☐ SEAMED AND SEAMLESS METAL HOSE

☐ PRECISION BELLOWS

☐ IGNITION HARNESS

☐ IGNITION SHIELDING

☐ ELECTRICAL CONNECTORS

☐ RIGID AND FLEXIBLE WAVE GUIDES

☐ FILTERS

☐ FUSES

TITEFLEX, INC.
517 Frelinghuysen Ave.
Newark 5, N.J.

Please send me without cost information about the products checked at the left

MAIL COUPON TODAY

NAME _____

TITLE _____

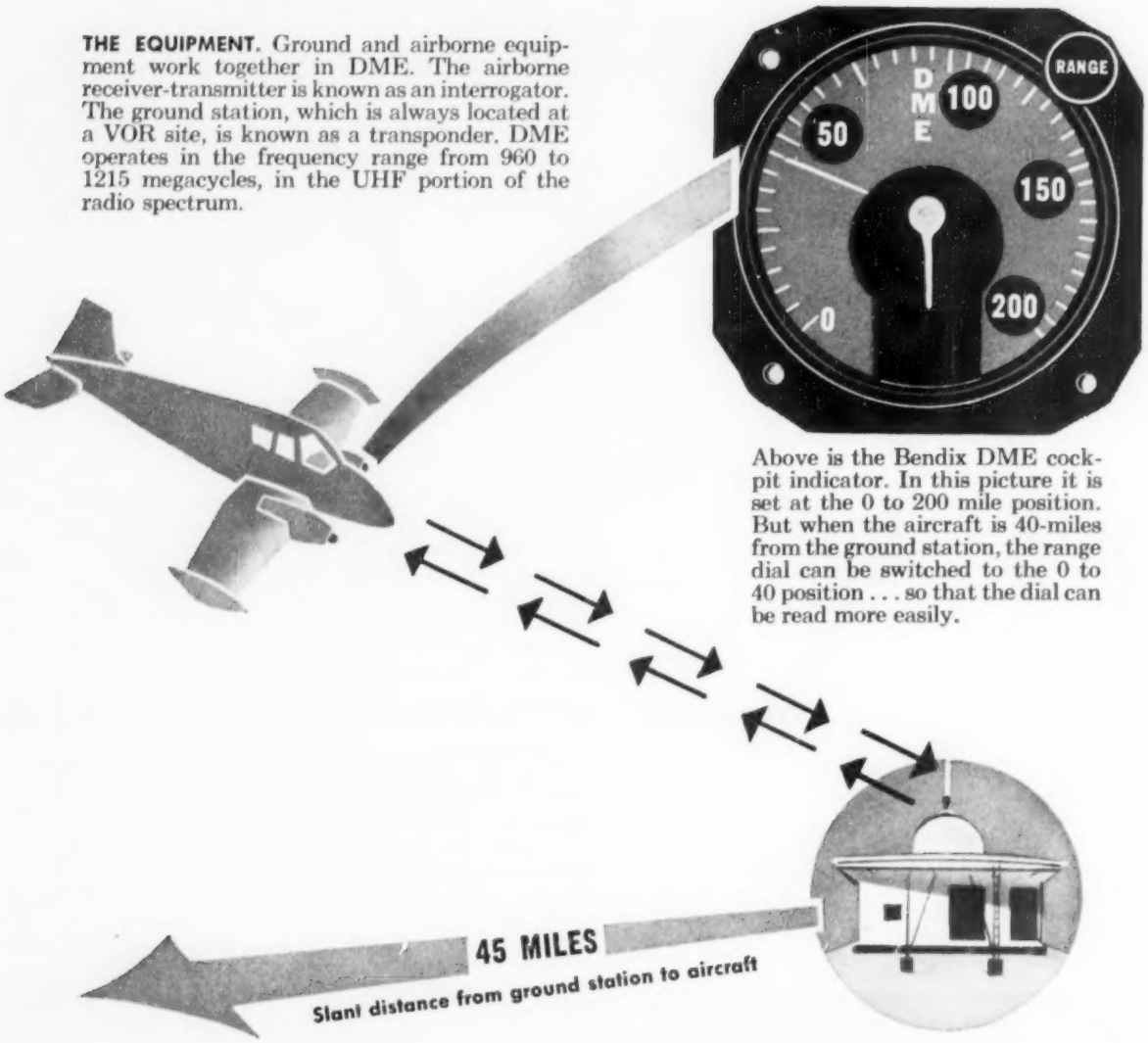
FIRM _____

ADDRESS _____

CITY _____ ZONE ____ STATE _____

NOW IN PRODUCTION
BENDIX DISTANCE

THE EQUIPMENT. Ground and airborne equipment work together in DME. The airborne receiver-transmitter is known as an interrogator. The ground station, which is always located at a VOR site, is known as a transponder. DME operates in the frequency range from 960 to 1215 megacycles, in the UHF portion of the radio spectrum.



Above is the Bendix DME cockpit indicator. In this picture it is set at the 0 to 200 mile position. But when the aircraft is 40-miles from the ground station, the range dial can be switched to the 0 to 40 position . . . so that the dial can be read more easily.

HOW IT WORKS. The interrogator in the plane radiates a series of radio frequency pulses. These are received at the ground station where they *trigger* the ground transponder . . . which in turn, transmits a reply signal to the plane. The elapsed time, in microseconds, between transmission of interrogation signal and reception of the reply signal is used to compute automatically the slant distance between the plane and the point where the ground station is located. No triangulation or other time consuming effort is required of the pilot. He merely reads the distance in miles on the DME indicator in the cockpit. (In example above aircraft is 45 miles from ground station.)

for the first time...
MEASURING EQUIPMENT

To executive type and corporate aircraft, DME means economic, direct flights over unmarked airways . . . with a positive geographical fix at all times. It makes possible instrument approaches to near-to-destination airports that otherwise might have to be passed up.
To all planes, DME means better use of the sky. Better holding procedures . . . more accurate ETA's . . . less wasted space on longitudinal and altitude separations . . . expediting arrivals and departures. DME gives *provable* saving in operating costs.

You've been hearing about DME since 1946. Now it's available. Developed by Hazeltine Electronics. Flight tested. Ready for installation by Bendix Radio. It's the airborne (DME) instrument that accurately measures the distance of a plane from a ground station. All set to work with some 300 VOR and ILS ground sites that have been installed in anticipation of this DME development, that had to come in system navigation.

Reduces operating costs

DME is a brand new navigation and safety aid. But even more, it brings *provable* reduction in operation costs. Cold cash savings that you can pick up and see. DME/VOR brings savings in fuel consumption . . . flight time convenience to passengers, better traffic control.

Holding at Unmarked points

Holding for the big and congested airports is no longer limited to range intersections, homing facilities or airway markers. With Bendix DME, aircraft can now hold at any point within range of a DME/VOR station. Holding patterns can be tighter, closer in, more accurately executed. Holding can now be on actual distance covered, not on elapsed time. No more need for wasteful wide-area "Buffer Zones." Holding away from airway intersections, means too, that through traffic can go by without delay.

Unmarked airways

Much of the travel of the executive or corporate type aircraft usually ends up off the beaten path. DME means time and money saved on these flights. Any pilot in a Bendix DME equipped plane, flying within range of a VOR/DME range station can pinpoint his location any time he wants to on an unmarked route. He can have a continuous navigational fix. With azimuth information from the VOR range, and with distance reading information on his DME, the pilot knows his geographical location at all times.

Instrument approaches to fields

Few, if any, of the fields served infrequently, or not at all by the scheduled airlines, could be approached safely with VOR alone. Now for the first time, Bendix VOR plus Bendix DME gives pilots both a bearing . . . and the precise slant distance to the minimum let-down point. Are there obstructions near the airfield? A television tower? A smoke stack? A warehouse? The latest map shows them. Your Bendix DME/VOR provides a reliable way to determine that the obstacle has been passed on an approach . . . and that a let-down may be safely started.

More accurate ETA's

The Bendix DME allows the pilot to estimate arrival times more accurately. Flight tests prove that a pilot with DME on his instrument panel can forget about head winds, tail winds . . . triangulation, etc. His ground speed is always right in front of him on the Bendix DME computer. All it takes is a little mental arithmetic (like how far did I fly in one minute . . . two minutes?) Whatever the change . . . the pilot can adjust his power to maintain his promised ETA. Accurate ETA's reduce holding and altitude-changing along the airways. They reduce wasteful time separations. Save time, money and increase passenger convenience.

Orbiting

Orbiting . . . regardless of wind conditions, a pilot is now able to fly an accurately controlled circular course. This exact arc can be flown around a DME/VOR at selected distances from the station and at varying altitudes.

This expedites departures and arrivals. It bypasses holding stacks at intersections. It all saves time, fuel and money.

And as pilots become more familiar with DME/VOR many other advantages will be developed. Bendix DME is another great step forward in system navigation. For further information, write to Bendix Radio, 2120 North Charles Street, Baltimore, Md.

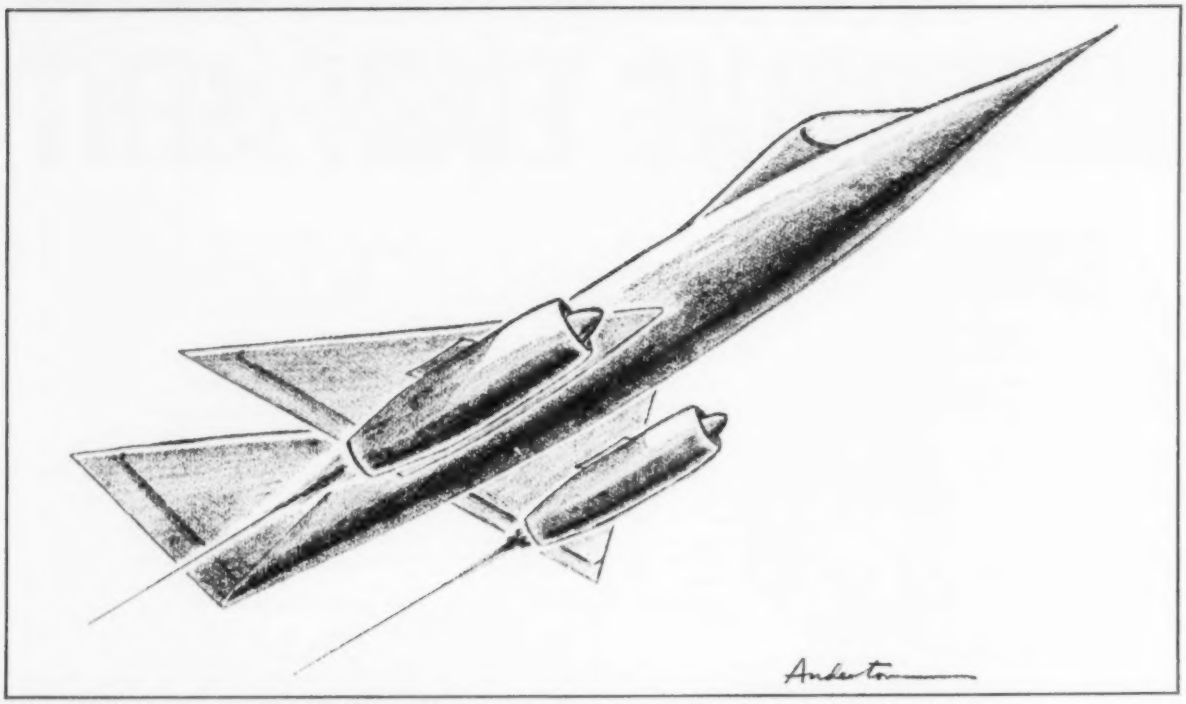
BENDIX* RADIO
BALTIMORE 4, MARYLAND
A DIVISION OF BENDIX
AVIATION CORPORATION

Export Sales: Bendix International Division
72 Fifth Avenue, New York 11, N.Y.

THE NAME Bendix AVIATION CORPORATION MILLIONS TRUST

*REG. U. S. PAT. OFF.

Bendix THE MOST TRUSTED NAME IN **Radio**



TOMORROW'S DAY FIGHTER probably will have delta wing, needle nose, lightweight jets, integral construction.

More Thrust, Less Weight Are the . . .

Two Paths to Day Fighter Superiority

Getting more power from engines is as important as 'stripping down' planes for better performance.

By David A. Anderton

We are heading for a new cycle in aircraft development with a type designated as the day superiority fighter.

Basis for the cycle is the need for an airplane that will outfly and outfight anything the enemy can put up.

Now under development at many of the major airframe manufacturers in the country, the day superiority fighter is nearest to reality at the plants of Lockheed, North American and Northrop.

▶**Design Preview**—Within the next year or so, the preliminary designs will have been sifted and finalized. The recent advances in airframe construction techniques will be coupled with the latest aerodynamic developments and the biggest, most powerful engines to produce the new breed.

Here is what they may look like.

• A needle-nosed fuselage houses the gun battery of four 20-mm. cannon in the nose. Behind the armament and its necessary radar gunsight sits the pilot. He may be using an ejection seat, but there is a chance that a survival capsule of some kind could be built for equal or less weight and provide more protection and safety for the pilot.

• The airplane is built around a delta-wing layout. Two lightweight turbojet units are slung underneath the wing about halfway out the span. These engines can be replaced quickly for easy maintenance in the field; as better powerplants come along, they can be slung on the same sets of fittings and improve the performance of the airplane further.

• Top speed of the craft will be over the sonic mark, perhaps as high as Mach 1.5. Sea level rate of climb can be up around 20,000 fpm., and operational ceiling will be above 60,000 ft.

• The construction will be largely of integral panels, made in quantity on the new giant presses now beginning to make their weight felt in aircraft development.

▶**For Understanding**—Perhaps the first thing to have understood about the term "day superiority" fighter is the meaning of the word "superiority." It has nothing to do with command of the air; instead it defines the aerodynamic performance of the airplane.

Genesis of the type probably began with the first pilots' reports from combat in MiG Alley. It was frustrating for Sabre pilots to be forced into a defensive position to await combat at the choosing of the enemy. The MiG pilots, with a margin of superiority in climb and ceiling, could fight or flee at will, and there was nothing the Sabre pilots could do about it.

To them, MiG Alley became a draw, regardless of the impressive ratio of MiG kills run up by the Sabres. You win an air war, said the pilots, by carrying the fight to the enemy; this we can't do.

To these early pilot reports was added the weight of opinion from engineers like Edward Heinemann of Douglas, who saw in contemporary fighter

airplanes a trend towards increased cost and complexity which was staggering to watch.

► **Pounds and Performance**—Pilots in Korean combat saw the performance difference between MiG and Sabre in terms of the weight difference. Four thousand pounds of aluminum alloy and steel separated a loaded MiG from a loaded Sabre. This weight differential, according to the pilots, could be reduced by eliminating some of the frills in the Sabre. Duplication of systems, extra gadgetry, automaticity had to go.

In support of this view, one of Heinemann's concepts—growth factor—has been used by proponents of reduced weight. Heinemann pointed out that every pound of equipment added meant about 10 lb. of airframe weight to carry it around. The ratio of ten-to-one was considered as an average for contemporary fighters, although it was noted that the factor could be 15 or 20 for high-performance aircraft.

It is possible to carry the use of this ratio to extremes, however. It is not an inflexible number, but an engineering guide. It won't hold as you keep stripping weight out of the airplane.

Take the Sabre as an example. Indiscriminate use of the growth factor would tell you that 800 lb. of equipment out of the Sabre would result in a reduction in gross weight from 16,000 to 8,000 lb. This is not likely.

► **Stripping**—There are lots of things, the pilots said, that can be pulled out of an airplane to make it lighter. Using the Sabre as an example again, the pilots have compiled a long list of unnecessary items. On this are the self-sealing fuel tanks and armor, so long considered an integral part of a fighter.

Duplicate or emergency systems for landing gear extension and for the primary fuel system could go. So could motor operation of the canopy. So could parking brakes.

Then, the pilots said, if the airplane could be stripped of that extra equipment, it should be possible to reduce the structural weight required to carry that stuff around. You wouldn't require as much room inside the airplane, and that would mean a smaller enclosed volume for fuselage and wings.

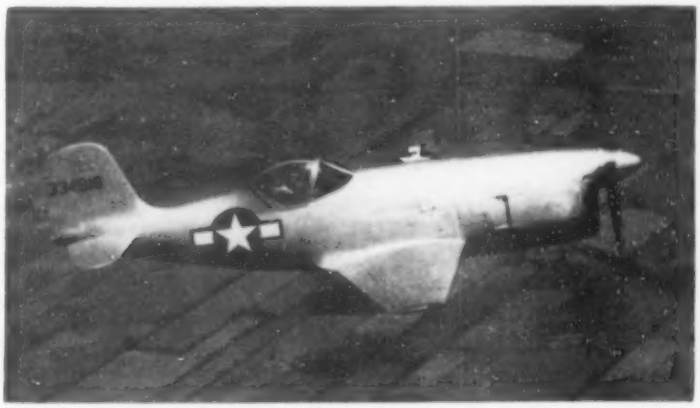
A smaller airplane would also be a lighter airplane. So this kind of thinking has led to the idea of the "stripped-down" fighter for day superiority, an idea that is backed by almost everybody in the Fifth Air Force now fighting the combat air war in Korea.

The pilots say they want an airplane that will outperform and outshoot the MiG's successors. This means performance at the high end of the transonic region (Mach 1.2 or so) and a battery of cannon.

But in addition the stripped-down

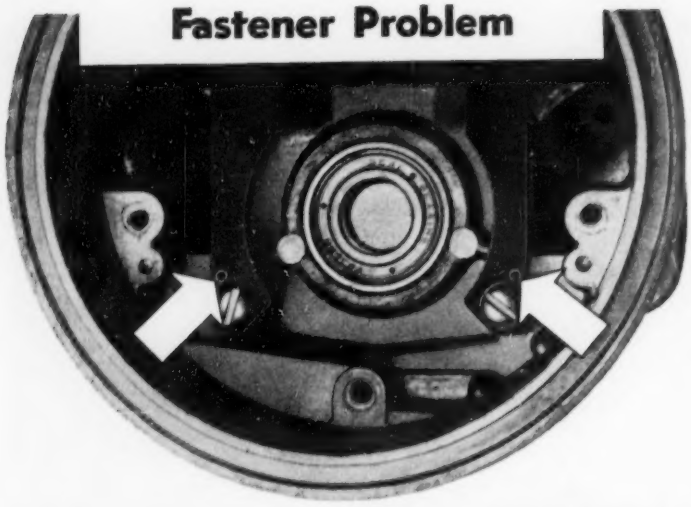
World War II Light Fighter Designs...

ZERO agile Jap World War II fighter (here in U. S. markings) carried two cannon, two machineguns, weighed less than 6,000 lb.



XP-77 Bell powered this 4,000-lb. interceptor with Ranger engine, armed it with 20-mm. cannon, two .50-cal. machineguns.

F8F-1 Grumman Bearcat carried four cannon in rugged airframe that weighed less than 10,000 lb. Engine delivered 2,500 hp.



How McCULLOCH MOTORS

does a combination

strengthening and fastening job

This aluminum alloy, die-cast magneto body is part of a drone aircraft engine manufactured by McCulloch Motor Corporation. To strengthen the holes in this casting, and to locate the coil lamination assembly, McCulloch uses Rollpin. McCulloch engineers report that the Rollpin not only retains itself by the constant pressure exerted against the hole wall, but it also serves as a protective reinforcement to the soft metal casting. Simple assembly lowers production costs. And Rollpin actually strengthens the casting—it has greater shear strength than solid, mild-carbon-steel pins of the same diameter!

(with Rollpin illus.) dia. from 1/16" to ½"

Rollpin is the slotted tubular steel pin with chamfered ends. It is readily driven into standard holes, compressing as driven. Rollpin stays in place—regardless of impact loading, stress reversals or severe vibration. No precision-drilling, threading or peening . . . no extra operations!

If you use dowels, pins, rivets or set screws, or if you want to increase the shear strength of a part—Rollpin can cut your costs, too. Just mail the coupon for design information.

ROLLPIN TRADEMARK

Elastic Stop Nut Corporation of America
Dept. R20-425, 2330 Vauxhall Road, Union, New Jersey

Please send the following free fastening information:

☐ Rollpin Bulletin
☐ Elastic Stop Nut Bulletin
☐ Here is a drawing of our product.
☐ What self-locking fastener would you suggest?

Name ..... Title .....

Firm .....

Street ..... City ..... Zone.... State .....

fighter should also be less complex. Being lighter and less complicated should make it cost less in production.

The end point of this train of thought is a lightweight fighter which is smaller and cheaper than the 20,000-lb., $400,000 fighters we are beginning to develop now.

▶ **Weight Reduction**—It is certainly worthwhile to reduce the weight of an airplane. All other things being equal, if Airplane A weighs less than Airplane B:

- **Airplane A will outclimb B.**
- **Airplane A will turn in a smaller radius than B.**
- **Airplane A will operate at higher ceilings than B.**
- **Airplane A and B will have about the same top speed.**

There is one factor which is generally overlooked. It takes a lot of weight difference to show up as a substantial performance difference.

For example, lightening the Sabre by two tons—in other words, making it equal to the MiG in gross weight—would improve the Sabre rate of climb by about 30%. This would correspond to a sea level rate of climb of about 9,000 fpm., still somewhat below the 10,400 fpm. of the MiG. And getting two tons out of the Sabre would not be an easy task.

Most designers feel that there is no real payoff in a weight-reduction program after the airplane has been built; the time to save pounds is when the craft is still on the drawing boards.

▶ **More Than Light Weight**—But there is more to the airplane performance picture than reduced weight. All the other factors generally do not remain equal. Sticking to the Sabre series as an example, the F-86D is a larger and heavier airplane than the F-86A, but its aerodynamic performance is superior. As a fighting machine, it could be better than the A, because of the additional avionic gear it carries.

It is easy to overlook the fact that thrust and weight are equally important in the equations which describe the kind of performance that makes a superior fighter.

Thus pursuing pounds through the airframe is important, but not all-important. What you want is more thrust as well as less weight.

Perhaps a better way to look at it is to consider that a very important parameter for comparing fighter airplanes is the ratio of thrust to weight.

The higher the ratio, the higher will be the airplane's rate of climb, the higher its ceiling, and the smaller its radius of turn.

For the contemporary Sabre, thrust-weight ratio is about 0.35 at takeoff, rising to about 0.40 at combat weights. For the MiG, the ratio is about 0.5 or a little better. (If the ratio reaches 1.0

Only the Beginning...

In the 25 years that Eastern has been in business we have carried 23,681,753 passengers. Perhaps you were one of those passengers.

I am deeply grateful as I think back to Eastern's humble beginning. In 1928 we pioneered flying the mail between New York and Atlanta, a distance of only 940 route miles. It has taken many, many years of heartache, trial and error to bring Eastern to the system it is today.

From that beginning we have expanded to 91 key cities, covering 12,746 route miles.

During the past year alone we carried 4,237,327 passengers over two billion passenger miles.

Eastern's family has grown from its original 41 members to more than 9,950, all expertly trained to serve you.

If there is one factor that has contributed to our growth, we feel it has been the dependable record and experience of our personnel and equipment together with one of the finest aircraft maintenance organizations in the world.

You can be assured Eastern's personnel is thoroughly dependable. Through the years we have made it a practice to select our personnel with great care. We have one of the most comprehensive training programs in the industry. Many of those who started with us twenty to twenty-five years ago are still with us today, holding key positions. We are proud of this record.

In the selection of our airliners we spend years in studying and testing the finest aircraft available. Time and performance have proven that our Super-Constellations, New-Type Constellations and Silver Falcons are the *most advanced* and *dependable* airliners in the world.

Dependable airliners and dependable personnel have given Eastern a world-wide reputation for Double Dependability.

To uphold this reputation, we have established the finest maintenance base in the country, equipped with the best tools money can buy. Our airplanes are periodically given complete overhaul. Every single part is serviced in minute detail to make the airplane even better than new when it emerges from our shops, ready for service.

Looking to the Future

In this business of air transportation you must always look to the future. Ideas that were thought to be impossible yesterday may be obsolete tomorrow. Within the next ten years we will make more technical progress than we have in the past twenty-five.

Within ten years, for instance, possibly sooner, many airlines will be using jet equipment exclusively. We will then be able to fly between New York and Miami in 2-2½ hours.

For local schedule operation, I predict we will be using helicopters, capable of flying better than 200 mph.

The next big step-up in speeds after jets will probably occur within the lifetime of most of us, when, God willing, we will fly on atomic fuel, high above the stratosphere at speeds that almost defy the imagination.

I am sure that whatever is in store for air transportation, Eastern, as it has in the past, will offer you the finest, the fastest and the most dependable service that your money can buy.

Sincerely,

Eddie Rickenbacker

President and General Manager

Eastern Air Lines

25 YEARS OF DEPENDABLE AIR TRANSPORTATION

AVIATION PROGRESS MARKED—Here at Kitty Hawk, N. C., the aviation world recently paid tribute to the Wright Brothers for their achievement of powered flight in a heavier-than-air machine in 1903. And among the aviation pioneers taking part was Igor Sikorsky, whose aircraft have made a major contribution to air progress.

AROUND THE WORLD WITH THE FLYING JACK-OF-ALL-TRADES

ROTARY-WINGED PACK TRAIN—Airlift of vital construction materials, key personnel, and survey teams is routine on the Aluminum Company of Canada's vast smelting and power development project in the rugged Kitimat region of British Columbia. In a few hours big Sikorsky S-55s, operated by Okanagan Helicopters, Ltd., can haul loads mule trains would need days to deliver.

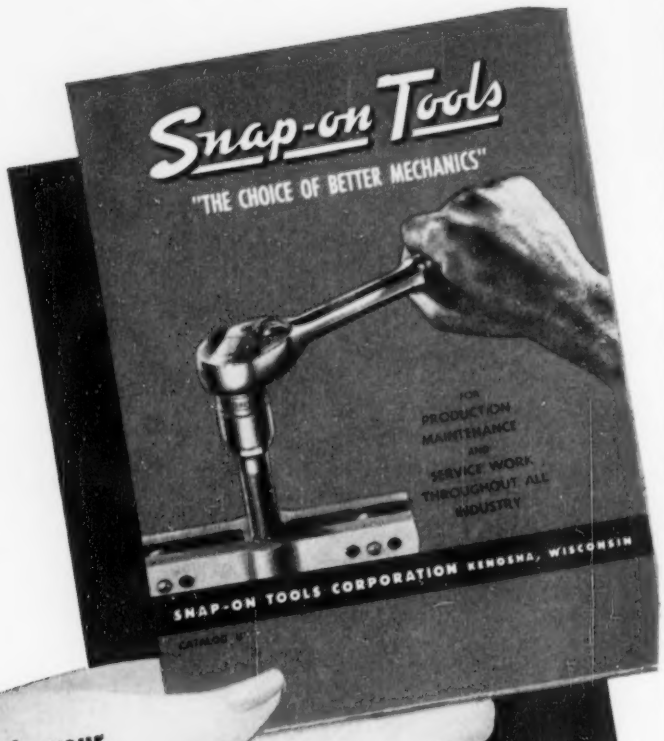
EASY DOES IT—A big H-19 Sikorsky carrying wounded men settles gently to the lawn in front of the Naval Medical Center in Bethesda, Maryland, ending a mercy flight which began on the battlefield. Regular transfer of Korea casualties arriving at nine military air terminals in the U. S. direct to service hospitals is planned by the Military Air Transport Service.

"SKY PILOT"—Ministering to the spiritual needs of men at sea is often difficult because of rough seas and the distance between ships in a fleet. But with helicopters such as the Sikorsky HO3S-1 shown above, chaplains can move from ship to ship with ease and come aboard by landing or by rescue winch.

SIKORSKY AIRCRAFT

BRIDGEPORT, CONNECTICUT

One of the Four Divisions of United Aircraft Corporation


Snap-on Tools
"THE CHOICE OF BETTER MECHANICS"
FOR PRODUCTION MAINTENANCE AND SERVICE WORK THROUGHOUT ALL INDUSTRY
SNAP-ON TOOLS CORPORATION KENOSHA, WISCONSIN

Here's your handy reference book of 4,000 time-saving tools for production and maintenance

NEW Snap-on* CATALOG

WRITE FOR YOUR COPY TODAY!

You'll want this latest 104-page edition of the most complete, most informative tool catalog published! This catalog lists all sizes and types of wrenches from largest needed on heavy machines to small ones for use on delicate instruments. Special tool equipment for fast repair of diesel and other engines. Includes new tools engineered by Snap-on to help handle difficult jobs with greater speed and safety. Write for your copy today.

SNAP-ON TOOLS CORPORATION
8020-D 28th Avenue, Kenosha, Wis.

(*Snap-on is the trademark of Snap-on Tools Corporation.

or better, vertical takeoff and climb is possible.)

▶ **Power Boost**—Examination of this ratio suggests that boosting the thrust of the Sabre or any other contemporary fighter would improve the T/W ratio and thus make it a better MiG-matcher. In theory this works out well; but in practice, the large thrusts needed can't be achieved by the usual schemes of liquid injection or afterburning.

So it is possible to conclude that stripping a Sabre of weight and boosting the thrust would improve the performance somewhat, but not by enough of a margin to give it a clear edge over the MiG.

The same philosophy holds for any of our current fighters; you can't take a Sabre or a Starfire or a Thunderstreak and strip it down with any final effectiveness.

The best way to develop a fighter with a high thrust-weight ratio is to start from scratch with some new concepts. The basic fighter facts of life are few: You need a gun battery with an effective sighting system, an airframe to house the battery and pilot, and a powerful engine to get the works to the enemy. Everything else goes along to extend the functions of one or the other of these parts.

▶ **What Has Been Done**—These primary needs have been known for years now, and have been translated into some very intriguing layouts in the past. Probably the lightest fighting machine ever built was the little British Grain Kitten, a World War I fighter which weighed in at 520 lb. gross with enough fuel for three hours and a Lewis gun as battery.

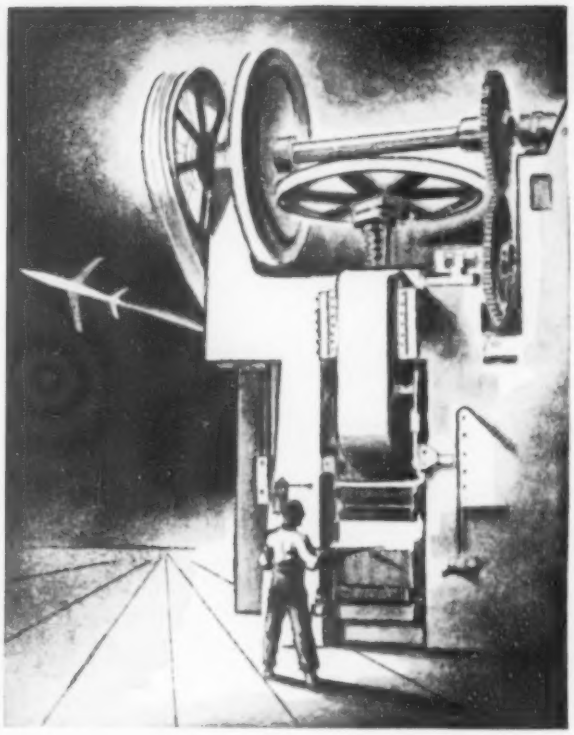
More recently the Germans tackled the problem in their last-ditch Heinkel 162 Volksjaeger (People's Fighter) a simplified wood-and-metal aircraft with performance equal to the jet fighters of the immediate postwar years.

Currently nearing flight test in England is the Folland Gnat, a design of W. E. W. Petter, creator of the English Electric Canberra. The Gnat is expected to weigh in under 6,000 lb.

In this country, Lockheed, Northrop, North American, Douglas and Grumman have been reported as working on fighters in the stripped-down category.

▶ **The Big Saving**—In all these designs, the ingenuity of the structural designers and aerodynamicists will come to nothing unless the engine manufacturers come through. With the engine representing the biggest single chunk of weight in a current layout and, of course, furnishing the only thrust, the paramount worry of every designer is going to be to get an engine of maximum thrust-weight ratio.

Right now, such engines are not in quantity production in this country



FORGING COMES OF AGE...JET AGE!

From horse-shoe to jet engine blade is an air-age away. Both are forged – but there the similarity ends. For UTICA's new methods of forging, with giant new machines and a world of new forging knowledge, combine to ring out results that would leave an old-style smithy gasping.

All the advantages of forging — at accuracies of a few thousandths!

Today's forging brings out the toughness, the strength of the metal – concentrates the strength where it's needed – yet ends with a finished part within a few thousandths of final size. Drastically reduces machining time and cost. Gives you a part that's minimum weight and dependable as only forgings can be! More than that, with UTICA's precise quality control system, you get accurately forged pieces by the thousands!

UTICA forging techniques for both "old" and "new" metals.

Today, as for many years, UTICA forges are producing our own fine alloy steel pliers and adjustable wrenches. And, with new techniques – many of them pioneered here – we are forging jet engine blades and other critical parts from the new, hard-to-handle metals. Perhaps we can help you – with small, precise forgings for defense today . . . with forgings for new products tomorrow.

Jobs available for technically trained personnel.

Our new "File Facts on Precision Forgings" outlines UTICA's methods and facilities for precision forging, now totally engaged in jet blade production, but ultimately generally available.

PRECISION····

U TI CA

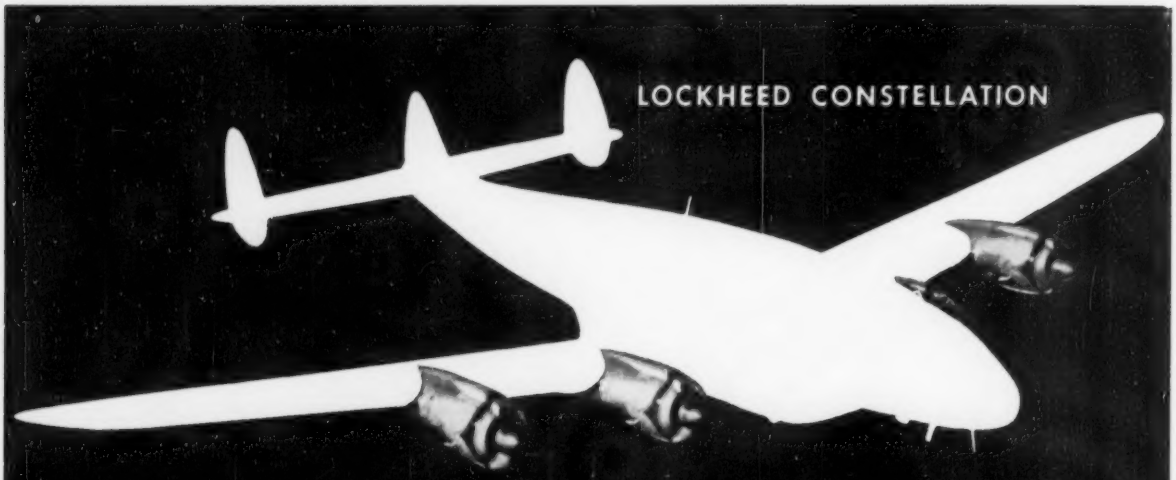
TRADE MARK

····FORGINGS

UTICA DROP FORGE & TOOL CORPORATION

UTICA 4, NEW YORK

MAKERS OF THE FAMOUS UTICA LINE OF DROP FORGED PLIERS AND ADJUSTABLE WRENCHES



We show you this picture of the Lockheed Constellation this way — to illustrate to you what Rohr is famous for: Building power packages — power packages for the Lockheed Constellation and other world-famous commercial and military planes. Of course, the Rohr aircraftsmen do more than this. Currently they are producing more than 25,000 different parts for all types of airplanes.

power packages by

ROHR

WORLD'S LARGEST PRODUCER OF READY-TO-INSTALL POWER PACKAGES FOR AIRPLANES

ROHR
AIRCRAFT CORPORATION CHULA VISTA AND RIVERSIDE CALIFORNIA

or abroad. Our turbojets are running around a ratio of two or three. The latest Rolls-Royce Avon is just a hair under 4.0, the highest ratio of any turbojet known to us at this writing.

According to one top engine company executive, there is no military requirement for such an engine. His firm is developing such a powerplant on its own, he said, and he is confident that other engine manufacturers are doing the same.

So it appears as if the engine and airframe designers can really start from the beginning and at the same level for these new fighters.

Wide Peace Use Seen For Earth Satellite

The military advantages of an artificial satellite have been greatly overstressed, says Harry Ross, veteran member of the British Interplanetary Society.

Speaking before the Midlands Branch of the BIS recently, Ross said that if it were possible to guide a satellite vehicle into an orbit, it would be possible to shoot it down just as easily.

But there are many and varied peaceful uses for such a satellite, Ross said. Here is how he detailed them:

▶ **From Small Beginnings**—In the immediate future, small instrument-carrying vehicles are likely to be developed. Perhaps the first would carry only a metallic balloon, and gas to blow it up, so that it would act as a reflector for radio waves. Such a device could be valuable for investigating the propagation of radio waves.

The next step would seem to be a larger vehicle—perhaps twice the size of the German V-2—which could carry a useful payload of about 50 lb. of instruments into an orbit several hundred miles up. At a height of 500 miles, the artificial satellite would have a velocity of 4.66 miles per second and would circle the earth once every 100 minutes. Data on cosmic rays, solar radiation, and similar measurements could be telemetered back to earth as long as power was available.

The next step would be the provision of electrical energy from the sun, either by a conventional sun mirror-plus-boiler system or, more probably, by means of a mirror and thermocouple.

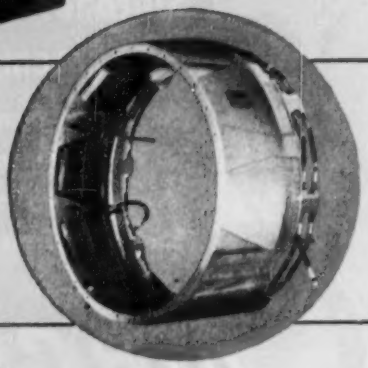
▶ **Relay Stations**—At an orbital height of 22,200 miles, with an orbital velocity of 1.9 miles per second, the satellite period would be equal to that of the earth. Any vehicle in this orbit, assuming a west-to-east movement, would appear stationary to a ground observer. Three of these satellites suitably situated could act as television relay stations and would be sufficient to cover the whole globe.

The originating station on earth

AN Fittings
Special Fittings
Flexible Metal Hose Assemblies
Silicone Rubber Hose Assemblies
We will be pleased to quote on all AN fittings and special aircraft components. Write or phone for further information.
AIRCRAFT COMPONENTS DIVISION
DUNBAR KAPPLE Inc.
406 N. River St. Batavia, Ill. Phone Batavia 5650
2140 Westwood Blvd. Los Angeles 25, Calif. Arizona 9-2202
10 S. Union St. Bay Shore, N. Y. Bay Shore 6161
1016 Fisher Building Detroit 2, Michigan Trinity 4-3580
127 Crosby Avenue Kenmore, New York Riverside 5186
1619 Beavers Avenue Dallas, Texas Woodlawn 1676
426 Transportation Bldg. Cincinnati 15, Ohio Garfield 0612
217 Ninth Ave., North Seattle 9, Washington SEneca 4948
10 High St., Room 506 Boston 10, Massachusetts Liberty 2-6935
267 E. Paces Ferry Road, N.E. Atlanta Georgia Exchange 1494

SECURITY SYSTEM for Jets

THE STORY OF ALL-WEATHER PROTECTION

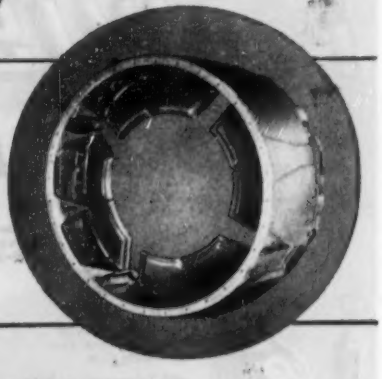


FULL POWER

A clear inlet for maximum performance.

FULL PROTECTION

Rugged defense against debris.



FULL CLOSING

For maximum range with engines inoperative. For ground protection.

Retractable Air Inlet Screens by

SMITH-MORRIS COMPANY

AIRCRAFT EXHAUST MANIFOLD SYSTEMS
GAS TURBINE PARTS AND ASSEMBLIES

FERNDALE 20, MICHIGAN

would beam its transmission to one of the satellites which would re-transmit it back over a wide angle. Power required for the re-transmission would be remarkably low, something on the order of 1.2 kilowatts for each station, said Ross.

Television relay stations could be set up before manned space flight is possible; but the nature of avionic equipment means that breakdowns would be certain to occur. It is possible to build in spare circuits with automatic switching in case of a fault, but this method could not be expanded indefinitely and sooner or later servicing or replacement of equipment would be essential.

This conclusion leads to the next step—a manned satellite. Such a station could act as a television and short-wave radio link as well as a research laboratory.

▶ **Unique Properties**—A satellite has unique properties among research laboratories. For example, the condition of free fall is inherent on a satellite. Again, space is almost a perfect vacuum and many experiments requiring exceptionally high vacuums could be attempted.

As metorological and astronomical observatories, these manned stations could prove very useful. Close watch could be kept on the world's weather, and surveys would enable accurate short-term or even long-term forecasts to be made.

The atmosphere of the earth has always been a major obstacle to astronomers, and even small telescopes set up on a satellite would prove exceptionally useful. Many of the details of the moon and the planets could be unfolded in such a laboratory.—**John Humphries**

Broader Education Urged for Engineers

Engineering education needs to be expanded into liberal arts and the humanities, said Lillian G. Murad, president of the Society of Women Engineers at its 1953 National Convention held recently in New York.

"This great family of people that join the various branches of all the professions," said Miss Murad, "should be given a concrete basis of education and a broader field of vision before they are permitted to enter into their respective niche and specialize in the work of an infinitesimal small part of the over-all truth".

Miss Murad urged educational leaders in colleges and universities to take careful stock of the lack of understanding caused by alienation of engineering from the arts and humanities. Engineers and other professions must be able

More motor per pound

in this completely new design

Now you can have a lightweight, continuous-duty, explosion-proof motor. This new construction in integral horsepower ratings represents another Westinghouse first in the Aviation Industry.

This revolutionary d-c motor is completely self-contained. No ducts or other external ventilation equipment is required. Special flame arrester design provides complete protection and permits continuous-duty operation . . . with only a slight increase in weight over corresponding open, self-ventilated motors.

These direct drive motors cover a range from 1 to 4 horsepower and weigh from 20 to 28 pounds. They are available with standard AND mounting pads or with special mountings. Radio noise filters are installed. This new design has been explosion-proof tested according to USAF specifications.

Look into this new motor. Call your nearest Westinghouse Office or write Westinghouse Electric Corporation, Aircraft Department, Lima, O.

J-03004-A

YOU CAN BE SURE...IF IT'S

Westinghouse

RYAN

AIRCRAFT AND AERONAUTICAL PRODUCTS

30 years Leadership in Aircraft and Components Design and Production

RYAN FUEL TANKS FOR B-47

L-17 NAVIONS IN KOREA

Ryan activities today blanket the field of aircraft and aeronautical product development and production. From the manufacture of airframe components and high speed pilotless jet planes...to electronic research and development...to executive-liaison airplanes and jet propulsion research, Ryan is helping to strengthen America's air-arm.

THESE GIANT WING TANKS for Boeing's B-47B Stratojet—the largest ever put into production—are an example of Ryan leadership. Each of these huge tanks, comparable in size to the fuselage of the Navion, requires over 30,000 electric spot welds and other advanced production techniques developed by Ryan.

RYAN L-17 MILITARY LIAISON NAVIONS have seen extensive combat service in Korea. They have received high praise for their excellent flying characteristics, efficiency in operating from short, rough fields, and proved ability in light transport missions and aerial reconnaissance.

AIRPLANE DIVISION

RYAN AERONAUTICAL COMPANY

LINDBERGH FIELD • SAN DIEGO, CALIFORNIA

to make themselves understood to allow for a greater unity of purpose.

"We need this harmony, and the place where we would initially find it would be under the guidance of our educational institutions," Miss Murad concluded.

Jet Tips Make Helicopters Safer

Dramatic proof of the safety of a jet-propelled helicopter, due to stored kinetic energy in its rotor, has been furnished recently by an accident involving the helicopter Ariel III, according to a report by Sncaso, the French aircraft manufacturer.

During takeoff for a flight test, the combustion chambers at the tips of the blade suddenly ceased operation. The jet helicopter was then at an altitude of approximately 60 ft. and flying at a low forward speed—a critical region for standard helicopters, Sncaso says.

But the pilot was able to get the aircraft into autorotation without any change in rotor rpm. and to reach the ground without mishap. Immediately after impact, the front wheel of the tricycle landing gear became caught in a deep rut and tipped the fuselage about 30 deg. The rotor blade tips damaged the tail of the copter, but the spars of the metal rotor blades were unharmed.

Sncaso says this incident has proven the safety features of the aircraft and the high resistance of its metal blades. The firm comments that a conventional helicopter in a similar accident would have been completely destroyed.

Flight Safety School Started by Air Force

A new flight safety education program for 360 Air Force officers has begun at the University of Southern California, Los Angeles, and is expected to pay off in spreading latest safetly operational techniques throughout the Air Force.

The first class of 21 officers began an intensive course in aeronautical engineering, aviation physiology and psychology aimed at aircraft accident prevention, and investigative procedures. Succeeding classes will follow at six weeks intervals for three years until 360 flight safety officers have been trained at the school.

▶ **Spread Safety**—Course material was contributed by the Air Force, aviation manufacturing industry, commercial airlines, Civil Aeronautics Administration, Civil Aeronautics Board, Flight Safety Foundation, and other safety research sources.

The officer students are captains and

(Advertisement)

Valve Talk

for WM. R. WHITTAKER CO., Ltd.

by Marvin Miles,
Senior Member, Aviation Writers Assn.

"Public apathy"... what does it mean? How does it apply to you and your family in this chaotic era of war and peace?

Most of us are too busy or too tolerant to keep ourselves informed on the critical need for a dual defense front against the Soviet abroad and Communism at home.

The Reds know our frailties only too well. They take quick advantage of them at every turn. They even spur us to abet those frailties when they hide behind the Constitution to the end that they can destroy it.

Sure, we read the headlines, listen to the radio reports, watch on television as the Communist dupes mouth smug defiance to official inquiry. Then, because we are apathetic, we turn to the sports page, switch to dance music or a TV comedy without adding up the score.

Pause a moment over a map and figure the mileage from the nearest Russian bomber base to your city, note the astonishingly short time it would take a 600 m.p.h. Red flight to reach you. Plan – if you can – what you will do and what your family will do if you have just one hour before those bombers are overhead.

We all know it can happen. Why, then, are we apathetic? Because we follow the path of least resistance, because it's too easy to let someone else do the worrying and the work. Unfortunately too many other Americans share our lethargy.

We seem to have a faculty for shrugging off current events without relating them to the past or the future. We read of an American plane shot down by a Red fighter over Western Germany, but somehow we fail to link the occurrence seriously with other planes missing or menaced in strange episodes.

We hear of atomic spies, missing documents, underground party operations and captive businessmen psychologically tortured to breakdown. Yet each seems an individual occurrence, and if we relate it to a pattern, we do so only vaguely.

I speak here not of the military, nor of officialdom, but of the rank and file of us. Fortunately, there are some in the nation – like our civil defense people – who are not apathetic. Even though they have been decried as hysterical by a stupid few, they are the strength that backstops our weakness.

Take the Ground Observer Corps, so necessary in filling the gaps in our radar screen. You'll find hundreds of posts undermanned or unmanned . . . a crying need for thousands of volunteers for a few hours each week. If we fail to fill the need, who then do we blame if a red-starred bomber slips through low under our electronic fence?

But what do most of us do about these things? Nothing!

We permit the Communist Party to exist, knowing that every member is an agent to execute the Soviet program of democratic destruction . . . a party, unlike our own, with cells that meet in secret conclave, requiring unquestioned obedience to authority in the Kremlin.

In our zealousness to protect our own freedoms we even defend those who would destroy us as they hide behind the Constitution. Somehow we forget that a government's first sovereign concern is to preserve itself. Only then can it guarantee freedom.

As Justice Holmes pointed out, the man who leaps up and yells "Fire!" in a crowded theater cannot defend his action on the ground of a guaranteed right to say what he thinks.

Unfortunately the rantings of the anarchist, the IWW, the Communist, are not so dramatic as that example. So we have ignored them . . . and now in addition to the Red-schedule Korean war, which Russia could stop at a moment's notice, we are in a struggle on two more fronts, whether we know it or not. We must put muscle on our defenses. At the same time, we must cleanse our country of the enemies who infest it.

Understanding, determination, cooperation will do it. But not until we shake off our greatest weakness — public apathy.

Think about it.

REGULAR, CLOSE TOLERANCE AND INTERFERENCE FIT TYPES

INSTALLED 5 TIMES AS FAST AS BOLTS

Save both weight and time in aircraft assembly by using Pheoll Hi-Shear Rivets. These precision made fasteners are easy to install and provide maximum shear strength when critical parts are joined.

PHEOLL'S EXTENSIVE MANUFACTURING FACILITIES provide the aircraft industry with a constant source for alloy steel, stainless steel and 75ST Aluminum Alloy Hi-Shear Rivets in all types and sizes.

Partial List of Styles Available

NAS 177 100° Countersunk Head
NAS 178 Flat Binding Head
HS 2R7 Close Tolerance 100° Countersunk Head
NAA 2R6 Stud Rivets
HS 11 Brazier Head
HS 23 Close Tolerance 100° Countersunk Head—75ST Aluminum Alloy
HS 26 Flat Binding Head—75ST Aluminum Alloy
HS 27 Close Tolerance 100° Countersunk Head—Close Tolerance Shank
HS 28 Flat Binding Head—Close Tolerance Shank
HS 37 Close Tolerance 100° Countersunk Head—Close Tolerance Shank—Minimum Tensile Strength 160,000 p.s.i.
HS 38 Flat Binding Head—Close Tolerance Shank—Minimum Tensile Strength 160,000 p.s.i.
HS 47 Close Tolerance 100° Countersunk Head — Interference Fit — Minimum Tensile Strength 160,000 p.s.i.
HS 48 Flat Binding Head—Interference Fit —Minimum Tensile Strength 160,000 p.s.i.

NOTE: Other types made to customer's specifications. Ask about Hi-Shears for industrial use.

Write for Free Catalog and Engineering Data Sheets

PHEOLL SCREWS BOLTS

majors, who also will receive training in public speaking and group education methods so they can spread their knowledge on operational level when they return to their bases.

Plans for the course were laid down by Maj. Gen. Victor Bertrandias, deputy inspector general USAF, and Brig. Gen. Richard J. O'Keefe, director of flight safety research. Lt. Col. Laurence H. Macauley, of the directorate of flight safety research, is supervising the course.

▶ **Cause and Effect**—Lecture courses on causes and effects of aerodynamic forces in accidents, inspection methods, structural and materials problems, and the human factor in crashes will be supplemented by laboratory experience with the university's human centrifuge, which simulates gravity forces encountered in high speed flight.

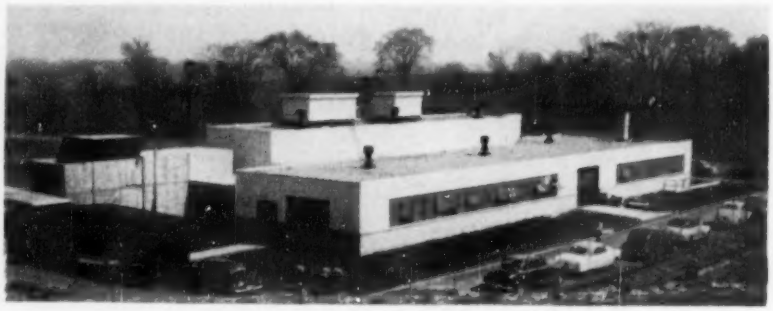
Three-Way Camera Records Scope Data

A new recording camera designed to provide a permanent record of transient, non-repetitive phenomena displayed on a cathode ray oscilloscope has been announced by J. A. Maurer, Inc. The camera provides three different modes of operation—single-exposure, continuously moving film, or revolving drum-type photography—and is easily changed from one mode to another, Maurer says.

In the moving film mode, the camera holds up to 25 ft. of film and provides a choice of film speeds between 0.4 and 100 in./sec. For drum photography, a 50-ft. capacity magazine supplies 20-in. film lengths cut to size with a built-in knife, permitting 25 runs without reloading. Drum speeds can be varied between 4 and 1,200 in./sec.

The camera uses 35- or 70-mm. film or photo-sensitive paper, either perforated or unperforated. Internal electrical contacts are provided for oscilloscope beam suppression during drum mode runs and the drum can be synchronized with an external event. Camera is equipped with a 3-in. f/1.9 lens as standard equipment with other lenses available if desired. The camera is built by Southern Instruments Ltd., of Surrey, England.

J. A. Maurer, Inc., Protographic Instrumentation Div., 37-01 31st St., Long Island City 1, N. Y.



McDonnell Opens Jet Test Facility

New jet powerplants for helicopters under development at McDonnell Aircraft Corp. are currently scheduled for test runs in the new McDonnell propulsion test laboratory at St. Louis.

Two test chambers in the laboratory will be able to simulate flight conditions for jet propulsion units as well as other items of jet aircraft, helicopters and missiles. A 3,000-hp. electric motor drives two compressors to provide the required airflow.

Soundproofing has come in for special attention in the construction of the labortory. Test-cell walls are made of 12 in. of reinforced concrete and 4 in. of soundproof insulation plus a sinusoidal labyrinth construction in the sound chambers.

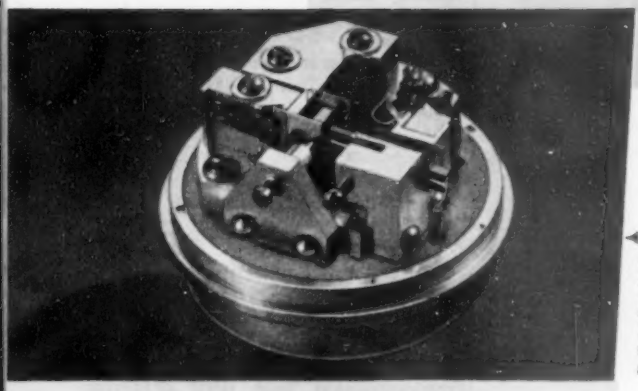
The twisting passages of the labyrinth between the concrete wall permit exhaust and steam from the jets to escape outside while the noise is retained inside. McDonnell says that a person shouting at the top of his lungs at one end of the labyrinth can't be heard by another person 25 ft. away.

"Floating cell" construction—probably similar to the General Electric jet laboratory at Evandale—is used for the two control rooms to keep engine noise and vibration to a minimum.

The two compressors were specifically designed for development tests. One delivers air at high pressure and low mass flow; the other will deliver a 13½-in. diameter air jet at near-sonic velocity. The air supply can be used for ramjet development, air-intake testing, and small windtunnel work.

The cost of the laboratory was $1.2 million, of which $850,000 went for the compressors. Architects and consulting engineers for the new facility were Sverdrup and Parcel, St. Louis, builder was Fruin-Colnon Contracting Co.

No ordinary relay...This! New CLARE Type T High Frequency Impulse Relay will follow 2500 cycles per second with life measured in billions of operations!



View of Clare Type T High Frequency Impulse Relay with dust cover removed

Exterior view of relay ready for mounting

specifications . . . .

MECHANICAL

SIZE: 1-15/16 in. diameter x 2-3/16 in. overall.
WEIGHT: 5 ounces.
MOUNTING: Equipped with mica-filled bakelite plug, to fit a standard 8-pin octal socket.
COVER: Removable dust-tight cover.
CONTACTS:
- **Type:** Form A (s.p.s.t., normally open)
- **Material:** Platinum-iridium
- **Gap:** 0.0005 inch
- **Pressure:** 30 grams, min. (Coil energized with 50 ampere-turns)

COIL:
- **Type:** Single winding, bobbin-wound
- **Wire:** Heavy formex

ELECTRICAL

COIL DISSIPATION: 0.5 watt (estimated max.)
CONTACT RATING: 0.05 amp., max. 50 volts ac, non-inductive. (estimated)
CONTACT BOUNCE: None
OPERATION:

Pull-in	15 ampere-turns
Drop-out	12 ampere-turns
Pull-in time	120 microseconds
Drop-out time	100 microseconds

RATE: Will follow 2500 cycles per second; aperiodic to 1000 cycles per second.
LIFE EXPECTANCY: 5×10^9 operations with zero contact current.
DIELECTRIC STRENGTH: 500 volts, rms.

TYPICAL APPLICATIONS

Coil inductance	0.3 hy (contacts open)
Coil inductance	0.35 hy (contacts closed)
Coil resistance	135 ohms
Pull-in current	10 to 12 ma.
Drop-out current	8 to 10 ma.
Normal coil current	40 ma.
Contact current	0.075 ma.

LIFE EXPECTANCY: Following a 1×10^8 operation run-in period, a life of 5×10^9 operations with a .075 ma. contact load over a 6-month period without readjustment.

Originally designed for use in an analog computer, the new CLARE Type T High Frequency Impulse Relay is now available for other applications which require a highly sensitive relay completely free from contact bounce and capable of a prodigious number of operations at extremely high speeds.

Its pull-in time of 120 microseconds and drop-out time of 100 microseconds enable this relay to follow up to 2500 cycles per second; aperiodic to 1000 cycles per second.

In a typical application, it has a life expectancy, following a run-in period of 1×10^8 operations, of 5×10^9 operations with a 0.75 ma contact load over a 6-month period without readjustment.

To achieve its high-speed, no-bounce, and other unusual characteristics, this relay is built to extremely close tolerances, with a high degree of precision, under conditions of utmost cleanliness. This necessitated the development of techniques never before employed in the manufacture of relays.

Even before this first public announcement of the availability of this truly remarkable relay, its fame has spread. Already dozens of inquiries and sample orders have been received from laboratories and development organizations which had learned of its existence through the manufacturer who first applied it in a well-known computer. It may provide the answer to one of your problems.

For full information on this new relay or for consultation on any relay problem, we invite you to contact your nearest CLARE sales engineer or write to C. P. Clare & Co., 4719 West Sunnyside Avenue, Chicago 30, Illinois. In Canada: Canadian Line Materials Ltd., Toronto 13, Ontario. Cable address: CLARELAY.

WRITE FOR BULLETIN 117

CLARE RELAYS

FIRST IN THE INDUSTRIAL FIELD

ALOFT with the LEADERS*

*The Sikorsky H-19 Helicopter

Sikorsky, an illustrious name in aviation, gains added lustre as reports of unprecedented rescue operations come to us from the Korean battlefront. Electrol, by aiding in the development of hydraulic installations of specialized design, contributes in some measure to the great service these "flying windmills" perform in the saving of precious human lives.

Better Designed Products Use Electrol Hydraulics

Electrol HYDRAULICS
KINGSTON, NEW YORK
CYLINDERS • SELECTOR VALVES • FOLLOW-UP VALVES
CHECK VALVES • RELIEF VALVES • HAND PUMPS
POWERPAKS • LANDING GEAR OLEOS • SOLENOID
VALVES • ON-OFF VALVES • SERVO CYLINDERS • SERVO

British Raising Jet Transport Production

Production rate on the new British turbojet and turboprop transport aircraft may be the deciding factor in the capture of a future world market, say some observers.

British manufacturers have resorted to extensive subcontracting in order to expand their production. Some of the new capacity so acquired is being used to build complete aircraft, some for making major components, such as wings, and the remainder for making small parts.

▶ **Staff Assessment**—In recent annual visits to Great Britain, AVIATION WEEK's staff members have been able to assess British production and methods. As a generalization, it is possible to say that the British use the same methods as do American manufacturers, but on a smaller scale.

There were three major deterrents to large-scale British aircraft production in the early postwar years: manpower, housing, and machinery. In recent months, most of the machine tools ordered during the first years of the postwar expansion have been delivered; others have been purchased from European countries and the U. S.

The shortage of manpower and housing continues, however.

Here is a round-up of the current status of British transport production and subcontracting.

▶ **DH Comet**—The world's first turbojet transport in service has been in production for several years at the Hatfield plant of the de Havilland enterprise; now two more lines are being developed. The first of these is at the Short Bros. and Harland factory at Belfast, Ireland, and the second is at DH's Chester plant, the largest aircraft production factory in England.

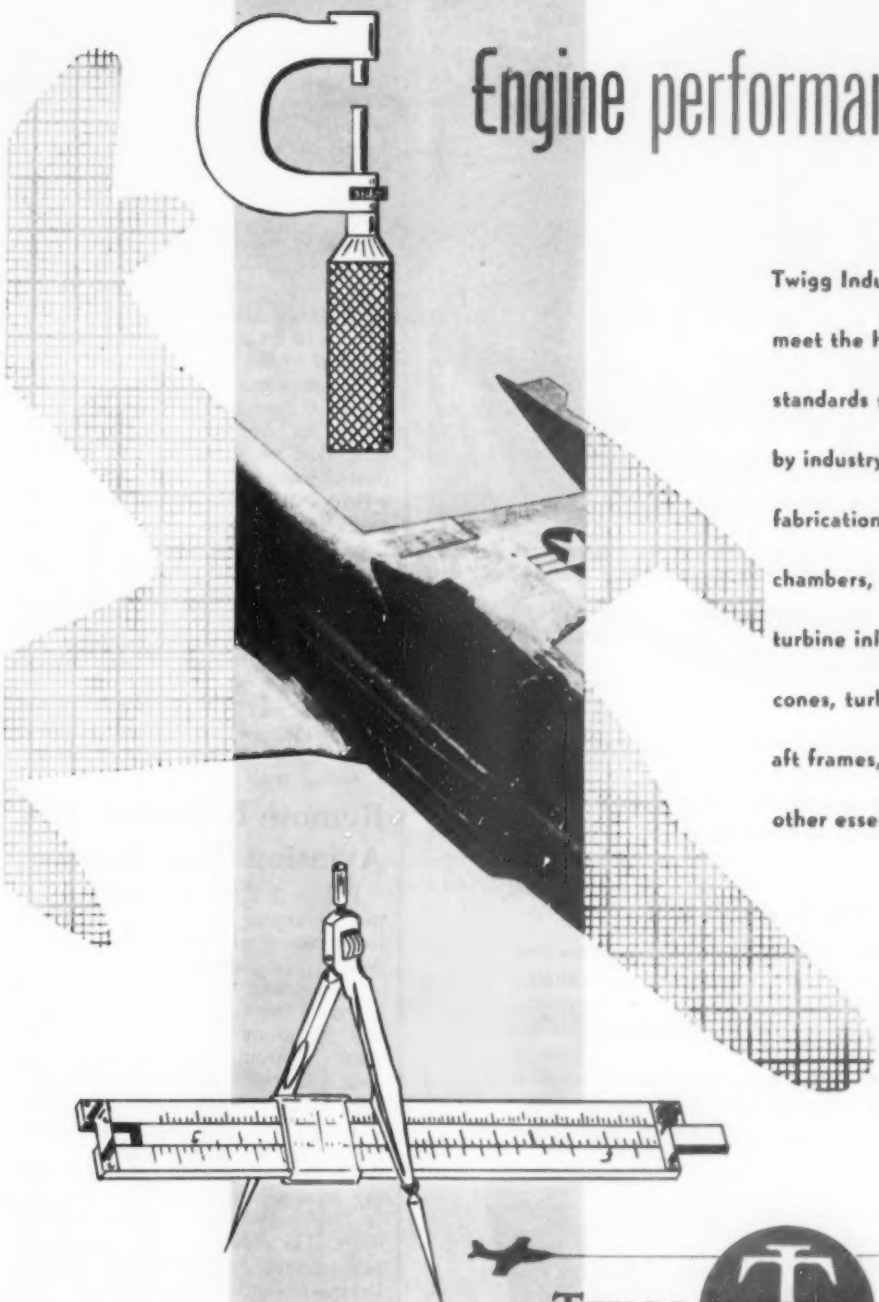
The Chester line was begun four

I don't know what it is . . . let's get out of here!

Hiller Copter News

Precision and skill in the fabrication of components and assemblies helping America's jets deliver the world's highest

Engine performance ratings

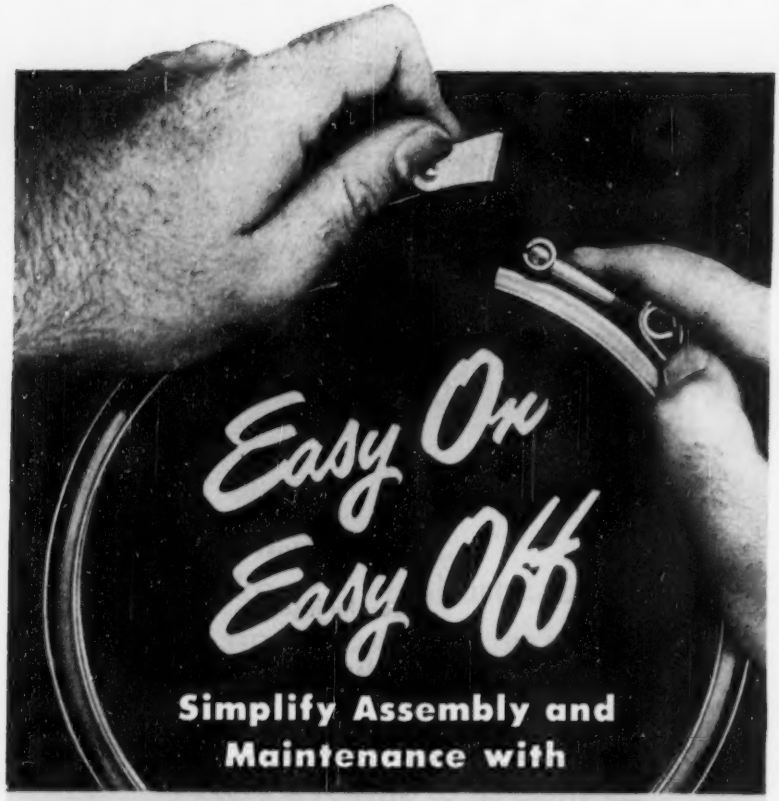


Twigg Industries . . . meet the highest standards set forth by industry for the fabrication of combustion chambers, transition liners, turbine inlet casings, tail cones, turbine casings, aft frames, brackets, other essential components.

TWIGG INDUSTRIES INC.

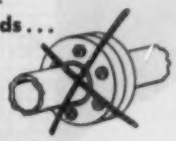
General Offices and Main Plant
1827 East National Road · Brazil, Indiana

Heat Treating and Brazing Plant
2005 S. Thirteenth Street · Terre Haute, Indiana



MARMAN V-BAND COUPLINGS

Exclusive swivel action latch and easy wrap-around action speeds up tube and duct assembly...
Removal for servicing or inspection in seconds...
no loose parts...eliminates belt ring.



POSITIVE ACTION

Maximum security under all conditions of heat stress and vibration . . . plus light weight, compactness, simplicity.

PRECISION ENGINEERING

Marman pioneered the design and production of precision couplings. Specialized facilities have been made available to industry for over ten years to fill every new coupling need.

For Catalog or information, write Dept. W-4

MARMAN PRODUCTS CO., Inc.
11214 EXPOSITION BLVD.
LOS ANGELES 64, CALIF.

3-425

months ago, and currently all jigs and fixtures are down and work has started on the first Comet II fuselage. Wing jigs are almost complete. This factory's first Comet II will be flying early in 1954, which is also the estimated flight date of the first Short-built Comet.

Horizontal tail surfaces for the Comet are being built by Folland near Southampton, and other small components are being produced at de Havilland's Airspeed Division at Christchurch and Portsmouth.

▶ **Vickers Viscount**—This turboprop transport, now in full production at the Vickers home factory at Weybridge, has recently entered service with British European Airways.

Tooling for Viscount production has begun at Vickers' plant at Hurn, and the first aircraft to be built there will fly next year. An increase in production at Hurn is expected to take some of the load off the line at Weybridge, making the latter available for other work. Hurn expects to be producing 100 Viscounts per year by the fall of 1955.

Saunders-Roe is building wings and center sections for the Viscounts; other companies have been called in to build horizontal tails, the fin and movable control surfaces.

▶ **Bristol Britannia**—Production of the turboprop Britannia airliner is concentrated at Bristol's factory, but other contractors will be called in if production is to expand. Bristol expects to reach 25 planes a year as soon as possible and another British company may later be called in to set up a second line.

There are also plans for production of the Britannia in Canada (AVIATION WEEK Mar. 23, p. 27).

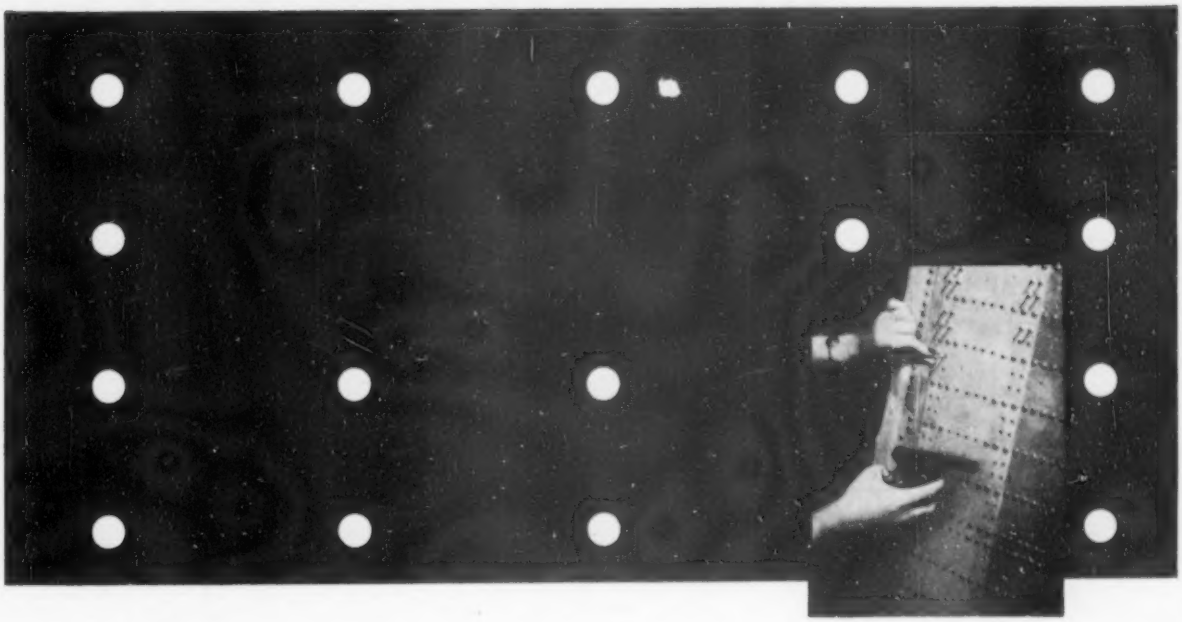
Remote Indicator Aids Aviation Test Work

Fischer & Porter has developed a remote indicator for aviation test work, to provide greater scale length and increase reading accuracy.

The device, primarily designed for use with the firm's 54-OLX flowmeter and Ratotronic electronic data transmission system, uses a 35-mm. strip scale which moves behind a fixed hairline. Space between the film and window is so small that parallax is virtually eliminated, the company says.

The extra-long scale provides a reading accuracy of better than one part in 2,000 when scale divisions are ¼ in. apart. The indicator can be adapted to any primary instrument, the firm believes. It can be located up to 2,000 feet from the flowmeter with no loss in accuracy.

Fischer & Porter Co., 10 Jacksonville Rd., Hatboro, Pa.

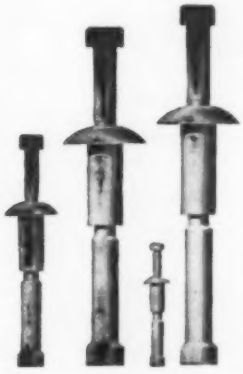


"A plane is a collection of aluminum holes held together by rivets," an aircraft designer once said jokingly in emphasizing the importance of rivets to aircraft construction. The majority are solid rivets which are driven and bucked by conventional methods. But a vital minority are actually precision parts, such as Cherry Blind Rivets, of which as many as 250,000 are used in one super-bomber—60,000 in a smaller fighter or transport.

These ingenious fasteners are set quickly and easily by one man from one side of the work with a special tool that pulls the rivet tightly into place without bucking, hammering or exploding. Blind rivets are virtually indispensable to modern plane construction as their use makes possible riveting in difficult-to-reach places, thus permitting freedom of design not possible with other types of fasteners. This feature also enables manufacturers to cut unit costs and speed production.

Townsend's Cherry Rivet Division at Santa Ana, California, is dedicated to the production and perfection of this single product. Here, highly trained personnel using Townsend designed and built equipment devote their entire attention to the manufacture of these precision rivets which are matched and tested against an elaborate set of specifications in order to give the excellent performance required. The greatest portion of Cherry Rivet production goes into military aircraft and will continue to do so as long as the nation's aircraft needs remain critical.

Cherry Blind Rivets are only one of some 10,000 different types, sizes and kinds of Townsend fastening devices produced at its several plants. With all these items at their command, Townsend engineers are able to give you unbiased advice—help select or design the fastener best suited for your product or assembly methods. A folder describing Townsend fasteners which are used to increase efficiency and improve products is yours for the asking.



Townsend

COMPANY • ESTABLISHED 1816

NEW BRIGHTON, PENNSYLVANIA

Sales Offices in Principal Cities

Cherry Rivet Division • Santa Ana, California

THE FASTENING AUTHORITY—Experience: *over 137 years*—**Capacity:** *sixty-million parts daily*—**Products:** *over ten-thousand types of solid rivets—cold-headed parts—Cherry Blind Rivets—Twinfast Screws—self-tapping screws—tubular rivets—locknuts—special nails—formed wire parts,* **Plants:** *New Brighton, Pennsylvania—Chicago, Illinois—Plymouth, Michigan—Santa Ana, California.*

WITH EVER NEW PEAKS IN

GENERAL CABLE SHIPMENTS
FOR USE WITH PRODUCTS PRODUCED

NATIONAL PRODUCTION GROWTH*

1944 1945 1946 1947 1948 1949 1950 1951 1952

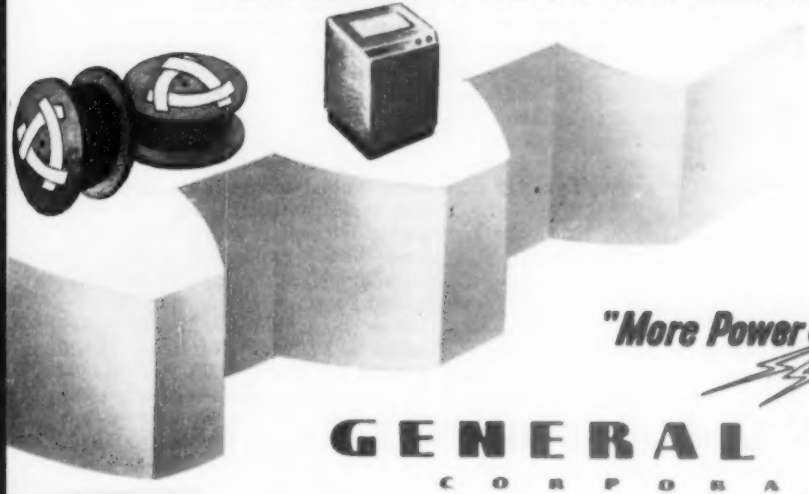
*Federal Reserve System Data

NATIONAL PRODUCTION...

GENERAL CABLE

Still means Consistent Dependable Supply

During a 70 year span as a prime supplier of wire and cable to every industry, General Cable's growth has been part of America's ever-mounting national production. Anticipating production trends—with our sights always toward growth—our production is planned for smooth, adequate supply. Evidence is in the thousands of varied wires and cables manufactured in the chain of strategically located General Cable manufacturing plants. Your needs are serviced through our sales offices . . . through our wholesalers . . . from plants, warehouses, and distributor stocks that blanket the country from coast to coast, and from our northern border to the Gulf of Mexico.



"More Power to You"®

GENERAL CABLE
CORPORATION

EXECUTIVE OFFICE: 420 LEXINGTON AVENUE, NEW YORK 17, NEW YORK • SALES OFFICES IN PRINCIPAL CITIES OF THE UNITED STATES

Boeing (and many other leading aircraft companies) uses Tekwood for strong, inexpensive containers to protect and ship various airplane parts

High STRENGTH

Wide RANGE OF USES

AND Handsome SAVINGS

IN SHIPPING COSTS

Your aircraft parts ride high, wide and handsome when they're shipped with Tekwood® protection.

Tekwood, the paper-and-hardwood sandwich, is rugged. It's tough. It gives you more strength . . . with less weight.

No wonder the largest manufacturers of aircraft parts use it to protect their products . . . and save on shipping costs at the same time.

Tekwood saves time and labor, too. It's easy to work and hard to hurt. It won't buckle, split or splinter. And it takes stenciling beautifully.

What's more, Tekwood's low in cost.

Investigate *all* of Tekwood's money saving features. For sample and detailed information, mail this coupon . . . today.

Genuine Tekwood is made only by

UNITED STATES PLYWOOD CORPORATION

Largest plywood organization in the world

55 West 44th Street, New York 36, N. Y.

Manufacturers of Weldwood® Plywood

Tekwood is a patented product—U. S. Pat. No. 1997346. Trade-mark registered.

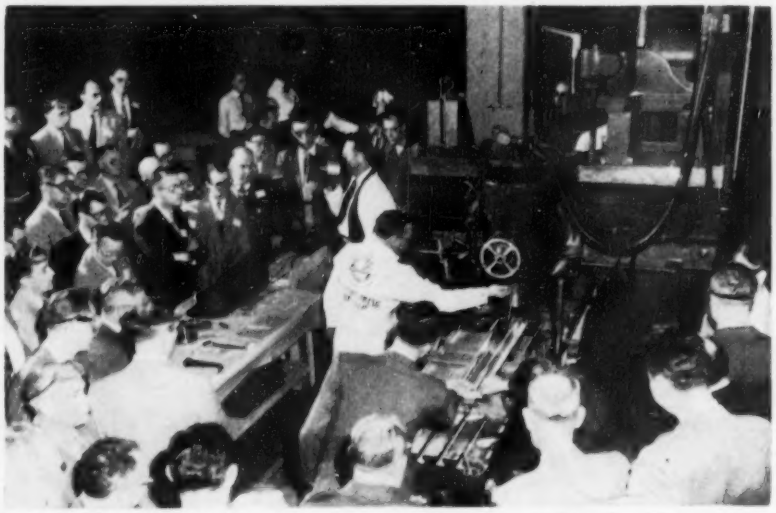
United States Plywood Corporation
55 West 44th Street, New York 36, N. Y.
AW-4-27-53

Yes, send me a Tekwood sample and the up-to-the-minute data.

Name.....

Address.....

City.....State.....



AIRCRAFT INDUSTRY representatives get look at new highspeed milling machine.

Fast Miller Gives Fine Finish

Machine is tailored to aircraft production, puts cutting of non-ferrous metal parts into high gear.

One of the latest machines specially tailored to aircraft production requirements recently was demonstrated at Consolidated Vultee Aircraft Corp.'s Ft. Worth Division on the occasion of the semi-annual meeting of the Aircraft Industries Assn.'s manufacturing-methods committee tooling panel.

Representatives of the National Tool Builders Assn. and other interested groups also attended the showing, which was sponsored by the Air Materiel Command's Industrial Services Branch, Production and Resources Division.

The machine—a highspeed vertical miller—puts cutting of non-ferrous metals in high gear. It was built by Cincinnati Milling Machine Co. under an Air Force contract after an extensive survey of aircraft industry requirements. Air Force prime interest in the development was to find a way of cutting machining costs.

While most milling machines are reported by Convair to reach maximum capacity at about 1,800 rpm., Cincinnati's new mill starts at this speed and can accelerate to 10,700 rpm. Table travel speeds of 375 in./min. are reported for this new tool, contrasting with 60 in./min. speeds of standard millers.

Finish on metal cut on the tool is extraordinarily smooth. Information is that the machine will give a finish of 6 micro-inches (.000006).

► **Industry Surveyed**—Under the contract, some of the principal aircraft plants were surveyed to ascertain what type of milling machine would be best suited to present and future needs for the aircraft industry.

Survey questions, it is reported, were designed to indicate: whether the mill should be vertical, horizontal, production- or tool-room type; the general work to be performed; spindle speed and horsepower; feed range; sizes and types of cutters generally used; table travel lengths; machine general ranges, and other specifications.

Plants surveyed included Boeing, Chance Vought, Convair, Douglas, Goodyear, Lockheed, McDonnell, Martin, Northrop, North American and Republic.

► **Specs**—Based on the survey, the machine evolved as a vertical-type production miller with an 18-in.-wide table having a travel of 48 in. Its specifications show a table feed of 0 to 375 in./min. (survey showed 0 to 300-plus); table traverse of 400 in./min. (survey, 300-plus); spindle speeds and horsepower of 1,800 rpm. at 10 hp., 3,600 rpm. at 20 hp., up to 5,400 rpm. at 30 hp. for 8-in.-diameter cutters, up to 7,200 rpm. at 40 hp. for 6-in. cutters, up to at least 10,700 rpm. at 50 hp. for 4 in. and smaller cutters, (survey, 10,000 rpm.); vertical range of

To get better prints... faster

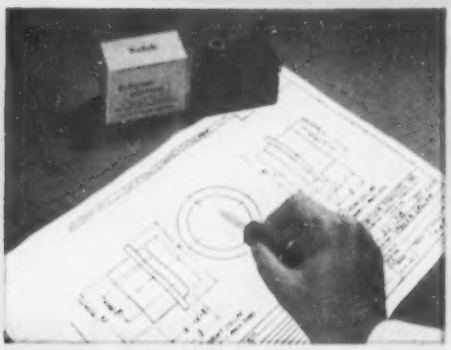
Tapco Plant, Thompson Products, Inc. uses Kodagraph Autopositive intermediates in print production.

The Tapco Plant knows full well that illegible shop prints pave the way for costly reading errors; knows, too, that Kodagraph Autopositive intermediates are low-cost insurance against such a possibility.

It therefore reproduces its more critical and complex jet and valve drawings on Kodagraph Autopositive Paper Translucent and thus obtains—quickly and easily—sparkling "masters" for print-making which have dense photographic black lines on an evenly translucent, premium-quality paper base; *which* will produce highly legible whiteprints time after time at *stepped-up* machine speeds.

Extremely fine-detailed drawings are reproduced on Kodagraph Autopositive Film, which captures the faintest detail . . . keeps close lines from "filling in". . . and produces top-quality photographic intermediates which have extremely fast print-back speeds.

No negative step . . . no darkroom handling. Kodagraph Autopositive Paper and Film are handled in exactly the same manner . . . produce positive photographic intermediates *directly*. First, they are exposed in one of the Tapco Plant's direct-process machines—or in a photocopy unit. Then, they receive standard photographic processing. A fast, convenient room-light operation all the way. And no new equipment needed.



Autopositive intermediates save creative drafting time. Tapco Plant makes necessary changes in its basic designs without costly redrafting by (1) making Autopositive prints of the original drawing; (2) removing the unwanted detail from the Autopositive reproduction with eradicator fluid. Then, the draftsman has only to add the new detail . . . and a print-making master is ready. *One* which will produce highly legible prints without confusing "ghost" images in the eradicated area.

Autopositive reclaims "unprintables." Many old drawings that have lost line density or are soiled or torn are transformed into print-making masters by reproducing them on Autopositive Paper or Film. Stains and crease marks are dropped out . . . weak detail is made more legible—saving hours of redrafting. Autopositive Paper is also used to duplicate a variety of office records, non-translucent vendor prints, etc.

Kodagraph Autopositive Materials

"THE BIG NEW PLUS" in engineering drawing reproduction

Write today for a free copy of "Modern Drawing and Document Reproduction." It gives complete details on the revolutionary line of Kodagraph Reproduction Materials, which you, or your local blueprinter, can process conveniently, economically.

MAIL COUPON FOR FREE BOOKLET

107

EASTMAN KODAK COMPANY
Industrial Photographic Division, Rochester 4, N.Y.

Gentlemen: Please send me a copy of your illustrated booklet giving the facts on Kodagraph Reproduction Materials.

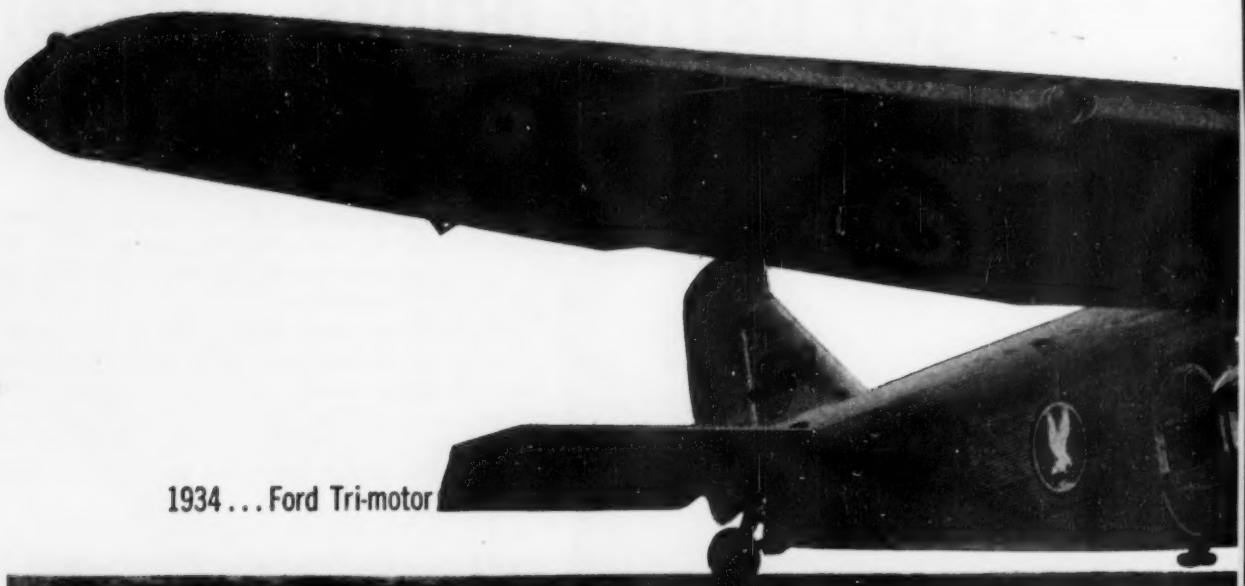
Name_____ Position_____

Company_____

Street_____

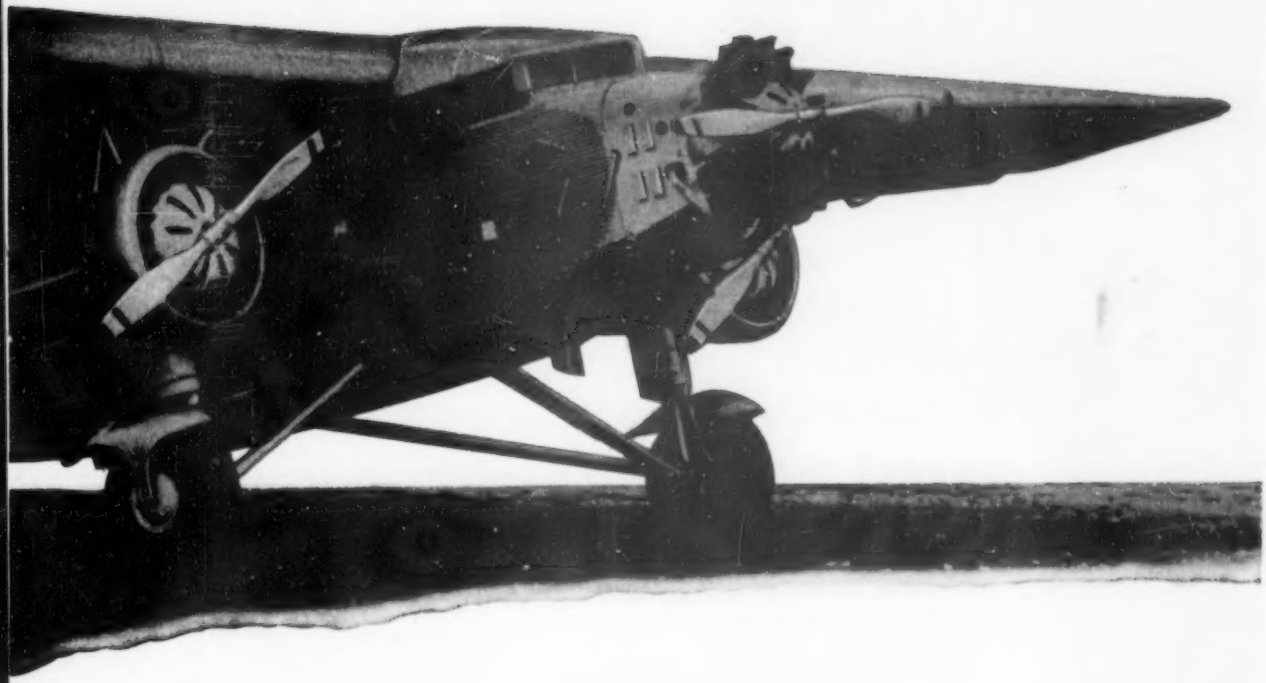
City_____ Zone_____ State_____

Kodak
TRADE-MARK



1934 . . . Ford Tri-motor

1953 . . . American Airlines DC-6B Flagship



From 1934 to 1953, American Airlines has used SINCLAIR AIRCRAFT OILS Exclusively!

Sinclair Aircraft Oils can prove their quality in your operations. For full details phone or write Sinclair Refining Company, Aviation Sales, 600 Fifth Avenue, New York 20, N. Y.

INTERCONTINENTAL

GOVERNMENT APPROVED AUTOMATIC SOURCE INSPECTION!!

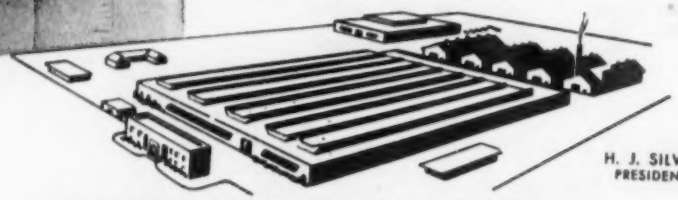
Precision work by trained personnel is available at low cost in our multi-purpose plant.

Our skilled tool makers and jig builders are producing tools to intricate specifications and our experienced machine operators are turning out thousands of machined parts to close tolerances.

Vast quantities of large assemblies for the Navy and the Air Force are being built by our sheet metal specialists and aircraft assemblers. We are ready to tool and produce components for you.

Write... Today!

Our engineering and production departments CAN solve your problems



H. J. SILVER
PRESIDENT

INTERCONTINENTAL
MANUFACTURING COMPANY, INC.
GARLAND, TEXAS

2 in. minimum and 22 in. maximum; cross range with spindle vertical of 34 in. (survey showed 18 in.); cross range with spindle swiveled, 18 in.

Spindle head swivels 45 deg. on either side of vertical axis. There are quick setup features, including power adjustment of the cross rail, and a motor-driven chip-suction system. Spindle has water-cooled bearings and mist lubrication.

▶ **Benefits Seen**—Advantages reported by Cincinnati for the highspeed milling of non-ferrous parts include: a production increase up to five times, with proper tooling; finish ranging from 6 to 20 micro-inches, depending on the type of material, speeds, feeds, design of cutter, and proper tooling; high degree of accuracy on the work—resulting in proper flatness, size, parallelism; less work warpage due to rapid dissipation of heat through the chips.

▶ **Convair's Experience**—Convair has been given the responsibility for investigating and evaluating the machine's uses on non-ferrous metals. The company also was requested by the Air Force to produce optimum cutter and fixture designs for use on the mill.

Convair has encountered a high degree of success with the machine in tests thus far, according to B. G. Reed, assistant division manager. He reports that B-36 parts have been milled to a degree of finish and flatness never attained with conventional milling machines. —**Irving Stone**

PRODUCTION BRIEFING

▶ **Fairchild Aircraft Division,** Fairchild Engine & Airplane Corp., Hagerstown, Md., has received a subcontract from Boeing-Seattle for a substantial quantity of B-52 Stratofortress outer wing panels and vertical fins. This is in addition to previous B-52 contracts. It does not affect Fairchild's present C-119 Packet production.

▶ **Land-Air, Inc.,** 440 W. Superior St., Chicago, has received a Navy contract for more than $1-million worth of aircraft engine analyzers. Included are installation and maintenance of the devices and training of Navy crews.

▶ **Stanley Aviation Corp.,** Buffalo, N. Y., plans to build a $400,000 branch factory on a ten-acre site in or near Denver to produce ejection seats for Boeing B-47 Stratojet bombers and North American FJ-3 fighters. The factory is scheduled to employ 200 persons in its first year of operation.

▶ **Kaman Aircraft Corp.,** Bradley Field, Windsor Locks, Conn., has leased 20,000 sq. ft. of factory space in Suffield,

ICE-FREE FUEL

FOR THE BOEING STRATOJET...

Even at high altitudes and sub-zero temperatures, the possibility of water moisture freezing on fuel filters presents no problem aboard the Boeing B-47. Equipped with a Lear-Romec Pump and Regulator, each of her six engines receives an automatically regulated supply of alcohol that prevents icing, assures an uninterrupted flow of fuel.

Equipped with explosion-proof motor, and secondary seal between motor and pump, this unit incorporates triple assurance against fire hazard. A special Lear-Romec Regulator or Flow Control Valve automatically limits capacity of pump to the required maximum, regardless of pressure in the fuel filter.

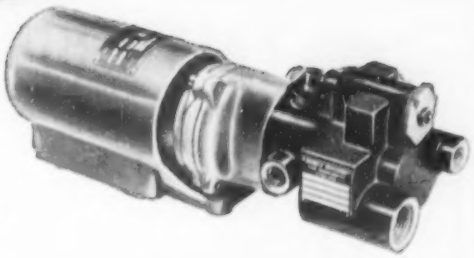
New items offering broad application possibilities are constantly being added to the comprehensive Lear-Romec line of Fluid System Components. For detailed information, write for the latest Lear-Romec catalog.

AIRCRAFT PRESSURIZING PUMPS

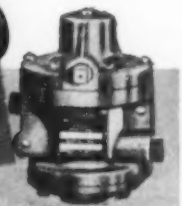
ENGINE-DRIVEN FUEL PUMPS

MODEL RG-5490-C ALCOHOL PUMP—

0.143 hp; weight 4.3 lb; rated capacity 60 gph minimum at 35 psi, 100 gph maximum at 50 psi, limited by Pressure Regulator RD-10120 illustrated below.



HYDRAULIC AND OIL TRANSFER PUMPS



PRESSURE REGULATOR

OTHER LEAR-ROMEC COMPONENTS:

Pressurizing Kits • Water Injection Pumps • Lubricating and Scavenge Pumps
Air Motors • Airborne Air Compressors • Centrifugal and Turbine Pumps
Camera Vacuum Pumps • Dehydrators • Absolute Pressure Switches
Radar Pressurizing Control Panels

Lear®

Advancing the Frontiers of Flight

LEAR-ROMEC DIVISION

ABBE ROAD, ELYRIA, OHIO

LEARCAL DIVISION, LOS ANGELES, CALIFORNIA
LEAR, INCORPORATED, GRAND RAPIDS 2, MICHIGAN
GRAND RAPIDS DIVISION, GRAND RAPIDS 2, MICHIGAN

RANGE EXTENDERS IN QUANTITY

. . . by **PASTUSHIN**

Super-streamlined, light-weight, aluminum jettisonable fuel tanks to increase range and combat effectiveness of America's fighting aircraft are being produced in great numbers by Pastushin's modern precision methods.

AIRCRAFT FUEL TANKS • SEATS • LANDING FLAPS
AILERONS • TAIL SURFACES • BOMB BAY DOORS

PASTUSHIN AVIATION CORPORATION
5651 West Century Boulevard • Los Angeles 45, California
LOS ANGELES INTERNATIONAL AIRPORT, LOS ANGELES, CALIFORNIA

IMPORTANT OPPORTUNITY

Chief Design Engineer

A prominent and well established originator and manufacturer of gas turbine aircraft engines requires a fully qualified man to assume complete technical and administrative responsibility for the design department.

Include all useful information with application to

PERSONNEL MANAGER, BOX

P-7663, Aviation Week
330 W. 42 St., New York 36, N. Y.

Conn., to handle expanded copter production, including the new twin- boom HOK. Some 100 men will be employed at the plant, scheduled for occupancy this month.

▶ **Alpha Tool & Supply Co.**, Closter, N. J., has expanded its distributorship of precision-made British industrial products to include Canada and Mexico

▶ **Jack & Heintz, Inc.**, Cleveland, received nearly $800,000 in orders for its aircraft accessories during the period Mar. 1-Mar. 15. Two USAF orders totaled more than $640,000 and orders from Boeing and Douglas came to more than $148,000. Present J&H backlog is approximately $56 million.

▶ **Pacific Airmotive Corp.**, Chino (Calif.) Branch, has started maintenance and repair work on commercial transports with first project involving 9,000-hr. major overhaul of a Pacific Northern Airlines DC-4.

Navy Contracts

The following contracts were announced recently by the Navy's Aviation Supply Office, 700 Robbins Ave., Philadelphia 11.

Bendix Aviation Corp., Bendix Products Div., 401 Bendix Drive, South Bend, Ind., primer and carburetor assys. for various aircraft, $118,372.

United Aircraft Corp., Chance Vought Div., P. O. Box 5907, Dallas, strut and duct assys., $165,413.

Monsanto Chemical Co., Phosphate Div., St. Louis 4, plasticizer, wax, 5,000 lb., $54,270.

Stewart-Warner Corp., South Wind Div., 1514 Drover St., Indianapolis 7, 169 ea., $53,233.

Lord Manuf. Co., 1635 W. 12th St., Erie, Pa., maintenance parts for mount assys., $38,159.

Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Calif., fitting used on strut assy., 39 ea., $32,555; parts, maintenance for R4D aircraft, $44,716; strut assy., 11 ea., $49,607.

Lowe Brothers Co., 424 E. Third St., Dayton 2, enamel, $81,981.

American Bosch Corp., 3664 Main St., Springfield 7, Mass., magneto assy. for R1930-76A, R1820-80 engines, 150 ea., $36,-315.

Reliance Varnish Co., 4730 Crittenden Drive, Louisville, Ky., thinner, cellulose nitrate dope and lacquer, 356,092 gal., $258,999.

Vickers Inc., 1400 Oakman Blvd., Detroit 32, wrenches, accumulator, $33,912.

Simmonds Aerocessories, Inc., 105 White Plains Rd., Tarrytown, N. Y., unit tanks for R6D-1 aircraft, $63,709.

Okonite Co., 1940 Canal St., Passaic, N. J., cable, watertight and non-watertight, for shipboard use, $339,194.

Packard Electric Div., General Motors Corp., 305-541 Dana St., N.E., Warren, Ohio, cable, copper, $25,147.

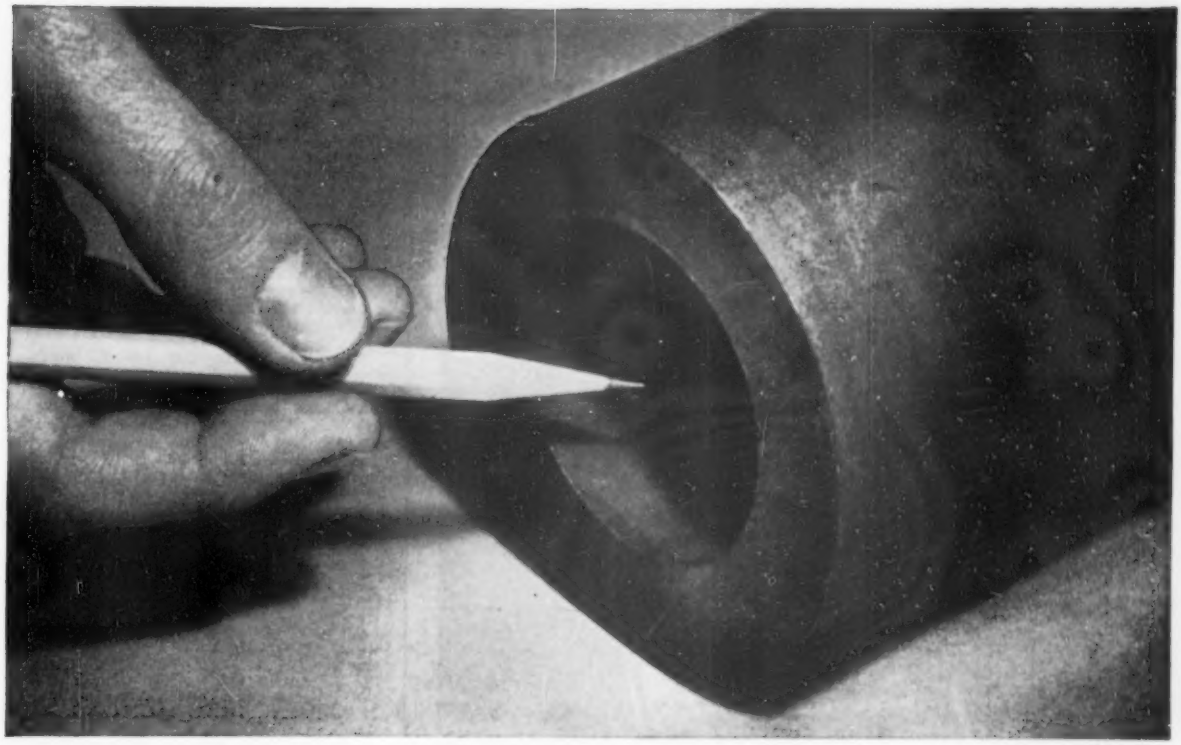
Electric Auto-Lite Co., 1201 Champlain St., Toledo 1, cable, copper, $32,682.

Delco Products, General Motors Corp., Dayton, Ohio, motor, for use on various aircraft, 497 ea., $48,393.

Wright Aeronautical Div., Curtiss-Wright Corp., Wood-Ridge, N. J., maintenance spare parts for ex-USN aircraft, $52,140.

William Armstrong Smith Co., 109 E. Forest Ave., East Point, Ga., primer, 15,500 gal., $31,290.

Aircraft Equipment Div., Bristol Co.,



If you make hollow parts, here's where you can save steel and machining time

THE hole is already there when you use Timken® seamless tubing. Often, you can go right into finish boring as your first production step. You save machining time. Screw machine stations can be released for other operations. You get added machine capacity without additional machines.

By using Timken seamless tubing in place of bar stock, you save steel, too. Scrap loss is cut. You get more parts per ton of steel. And to help you save even *more* steel, the Timken Company offers a tube engineering service which recommends the most economical tube size for your job—guaranteed to clean up to your finished dimensions.

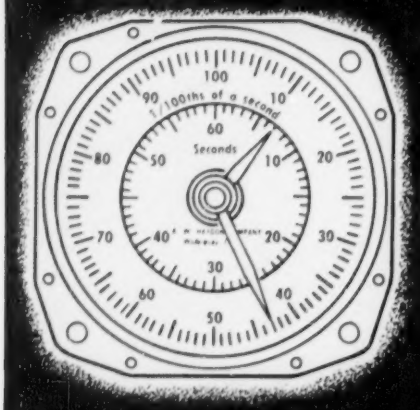
Timken seamless tubing gives you high internal quality because the piercing process by which it is made is basically a forging operation. Result: a uniform spiral grain flow for greater strength and a refined grain structure which brings out the best quality of the metal. And the Timken Company's rigid control keeps this quality uniform from tube to tube and heat to heat. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

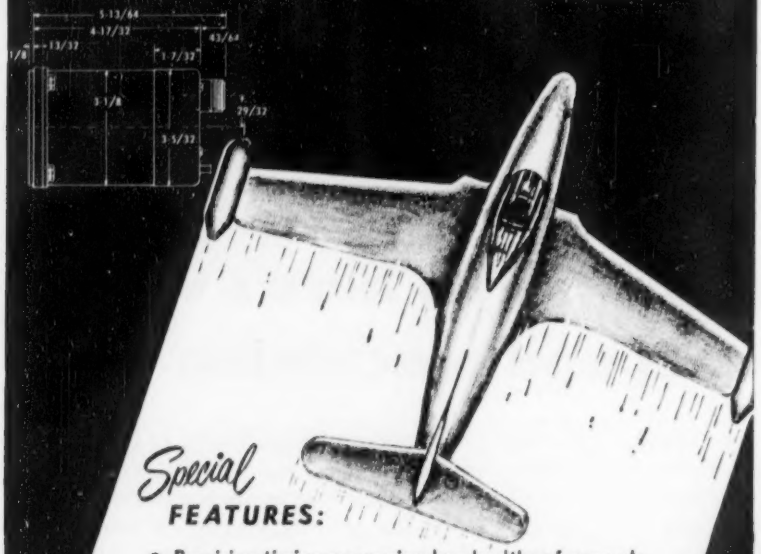
SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

NEW A. W. HAYDON COMPANY

STOP CLOCK



High Speed Stop Clock Accrued Seconds Indicator With Fluorescent Dial and Hands . . . Also Available For Other Intervals.



Special **FEATURES:**

- Precision timing measuring hundredths of seconds to one minute.
- Automatic reset.
- Hermetically sealed.
- For operation on 50, 60, or 400 cycles A.C. or 20-30V D.C. 400 cycle unit has D.C. clutch.

This new, hermetically-sealed *Stop Clock* further enlarges the complete line of A. W. HAYDON COMPANY A.C. and D.C. Timers, time delay relays and timing motors. This accurate, panel-mounted timer totalizes hundredths of a second up to a minute. Hermetically-sealed, it weighs approximately 2 lbs. Comes with automatic reset.

WRITE FOR CATALOG

The A. W. HAYDON COMPANY
222 NORTH ELM STREET
WATERBURY 20, CONNECTICUT
Design and Manufacture of Electrical Timing Devices

Waterbury 20, controller, 92 ea., $40,114.

Eastern Industries, Inc., 296 Elm St., New Haven 6, Conn., pumps, windshield degreasing, $111,027.

McGuire & Co., 833 Forty-Seventh Ave., Oakland 1, Calif., thinner, 188,000 gal., $62,980.

Tingley Rubber Corp., 903 Ross St., Rahway, N. J., overshoes, molded, all elastomer, non-slip sole, 23,000 pr., $55,660.

Aero Supply Co., 611 W. Main St., Corry, Pa., valves and strainers, for F7U-3P aircraft, $81,519; switch assys., $57,174.

Jay Mfg. Co., 4235 Clayton Ave., St. Louis, cable assys., $46,369.

Lunn Laminates, Inc., Oakwood Rd. & West 11th St., Huntington Station, L. I., N. Y., radome, 77 each, $125,125.

Central Paint & Varnish Works, Inc., 59-69 Prospect St., Brooklyn, N. Y., enamel, aircraft, 18,992 gal., $32,286.

Armstrong Smith Co., 109 E. Forrest Ave., East Point, Ga., enamel, aircraft, $36,285; enamel, 17,668 gal., $38,870.

Thompson Products, Inc., 23555 Euclid Ave., Cleveland 17, pump assys. for various aircraft, $337,837.

Westinghouse Electric Corp., 3001 Walnut St., Philadelphia, gear and clutch pack assys., $130,133.

Frey-Yenkins Paint Co., 251 North Sandusky St., Columbus, Ohio, enamel, $113,323.

Thiokol Corp., 780 N. Clinton Ave., Trenton, N. J., polymer powder, 84,000 lb., $107,-104.

Permutit Co., 330 W. 42nd St., New York 36, desalting kit, 7,060 each, $84,861.

American Machine and Metals Co., United States Gauge Div., Clymer Ave., Sellersville, Pa., items for gauge, 997 each, $40,-790.

McGuire & Co., 833-47th Ave., Oakland 1, Calif., thinner, 132,655 gal., $49,082.

Fast Writeoffs

Accelerated tax amortization for manufacturers expanding their defense facilities is granted by the government in the form of certificates of necessity.

In the following list of recent certificates, company name is given, followed by product or service, cost of construction deemed necessary for defense expansion, and the percentage of the expansion cost allowed for fast write-off. Fast writeoff permits property to be depreciated in five years.

- **Lyman Electronic Corp.**, Springfield, Mass., aircraft parts, $4,130, 70%.
- **Lee Co.**, Westbrook, Conn., aircraft parts, $3,800, 70%.
- **General Motors Corp.**, Rochester, N. Y., aircraft parts, $509,541, 65%.
- **C. B. Kaupp and Sons**, Maplewood, N. J., aircraft parts, $64,338, 70%.
- **Aircraft Engineering Products, Inc.**, Clifton, N. J., aircraft parts, $27,051, 70%.
- **Jacques Brass Specialties Co., Inc.**, Baltimore, aircraft parts, $72,100, 70%.
- **Capital Airlines, Inc.**, Washington, D. C., air transportation, $4,226,256, 80%.
- **Tietzmann Tool Corp.**, Englewood, Ohio, machining of aircraft parts, $23,777, 70%.
- **Light Metals Corp.**, Grand Rapids, Mich., aluminum extrusions for aircraft, $205,-742, 65%.
- **Monument Engineering Co., Inc.**, Indianapolis, aircraft parts, $85,038, 70%.
- **Stiger Precision Products Inc.**, Cicero, Ill., aircraft parts, $36,793, 70%.
- **Acme Industrial Co.**, Chicago, machining aircraft parts, $114,390, 70%.
- **Ryan Aeronautical Co.**, San Diego, Calif., aircraft parts, $34,808, 65%.
- **Sturgess, Inc.**, Glendale, Calif., aircraft parts, $161,918, 65%.
- **Leckinger Machine & Experimental Co.**, aircraft parts, $15,680, 70%.
- **Lockheed Aircraft Corp.**, Burbank, Calif., airplanes and parts, $2,875,000, 60%.

WHAT'S NEW

New Publications

SAE Aeronautical Drafting Manual, fourth edition, which has been adopted as a standard by aviation manufacturers, airlines and colleges has been expanded to include four new sections dealing with wrench clearances, torsion springs, parts interchangeability and contour zone tolerancing. The new manual is available from the Society of Automotive Engineers, 29 W. 39th St., N. Y. 18. Price $4.50. A binder is available for $2. Owners of previous editions may obtain a set of revised pages for $2.

Climatic and Environmental Criteria for Aircraft Design, Bulletin ANC-22, is aimed at providing plane and equipment designers with reference data on these phases. The material was prepared by the subcommittee on Air Force-Navy-Civil Aircraft Design Criteria, Munitions Board Aircraft Committee. Available from Supt. of Documents, U. S. Government Printing Office, Washington 25, D. C. Price is 35 cents.

AN Standard Books are being published in a two-volume set by Air World Publications, 1913 W. Ninth St., Los Angeles 6, Calif. The two books comprise 1,270 drawings. Price is $25. A revision service also is available. At a cost of $3.50 monthly, subscribers will be furnished with any specified standard drawing or technical publication on request.

Fifty Years of Powered Flight, 1903-1953, is a 125-page pocket-size booklet covering by month, day and year the most significant historical aviation events in commemoration of the 50th anniversary of the birth of flight being celebrated in America this year. The booklet is now available from the Admaster Creations Co., Toledo, Ohio. Price 25 cents.

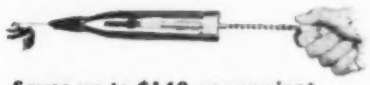
The Air Traffic Story is a report of a special committee of the executive committee of the Radio Technical Commission for Aeronautics. Available from RCTA, 1724 F. St., Washington 25, D. C. Price 50 cents.

Proceedings of the 1952 National Electronics Conference, Vol. 8, contains all of the papers presented at the meeting. It is composed of 835 pages and contains many charts, diagrams and tables. The book is Case bound, selling at $5. Earlier volumes, 2, 4, 5, 6 and 7 also are available at the same price. Write National Electronics Conference, 852 E. 83d St., Chicago 19, Ill.

Three engines can be safety wired with

ROBINSON WIRE TWISTERS

in less time than it takes to do one by any other method



Saves up to $140 per engine*

with split-second twisting action. 3 tools in 1 – pliers, cutters, twisters. Two sizes – 12" and 9". Now used by Army, Navy, Air Force, Pratt & Whitney, GE, TWA and hundreds of others. *Satisfaction guaranteed.* $19.50 each. $18.50 ea. in dozens. FOB, Sacramento, Calif.

**Sure, we have proof! Write for detailed report.*

RALPH C. ROBINSON CO.
Dept. AW6
BOX 494, NORTH SACRAMENTO 15, CALIF.

Narrow, Floating

ONE LUG NUT

Nutt-Shel

Manufacturers of self locking anchor nuts and bolt and nut retainers.

811 AIRWAY, GLENDALE, CALIFORNIA

CItrus 4-4191 CHapman 5-3693

3610 SERIES

Floats 1/32" in all directions. Narrow AN366F-AN362F envelope. Maximum torque out and push off strength. Meets applicable requirements of specification AN-N-10. All metal *(cadmium plated carbon steel);* also all *stainless steel* available as in 3710 series.

Sizes: *All standard sizes 6-32 through 3/8-24.*

WRITE FOR SAMPLES

Write on your letterhead for samples and ENGINEERING MANUAL. Manual contains dimensions, tolerances and material specifications.

Masking a Continent with **PERMACEL** Masking Tape speeds stenciling for Braniff Airways. No doubt there is an important use for **PERMACEL** on your jobs. Our Tape Engineering Service can give you the answer . . . without obligation.

PERMACEL
PRESSURE SENSITIVE
MASKING TAPES

INDUSTRIAL TAPE CORPORATION, NEW BRUNSWICK, N. J.

Telling the Market

Manufacturing Cost Control provides break-down charts, cost control forms and performance curves for metal-working firms, plus a five-step method of setting up cost-control system. Ask for Folder 117-48 from Howard F. Howard Co., 319 Fisher Building, Detroit 2, Mich.

Embedding of electrical components in Scotchcast insulating resins which feature moisture resistance, dielectric strength, adhesion, low shrinkage and temperature stability is described in booklet available from Minnesota Mining & Mfg. Co., 900 Fauquier St., St. Paul, Minn.

Applications of Du Pont nylon moldings are covered in a new series of brochures. Data is also given on molding and extrustion techniques. Write E. I. du Pont de Nemours & Co., Wilmington 98, Del.

Plant Layout is the third in a series aimed at administrative and operating executives. Included is an improvement worksheet for evaluating existing layouts. Earlier booklets were: **Material Handling** and **Industrial Maintenance.** Write Wheeler Associates, Inc., 15017 Detroit Ave., Cleveland 7, Ohio.

Aircraft acoustical and thermal insulations are described in Applications in Aircraft, a brochure being distributed by Fiberglas Corp., Toledo, Ohio.

Methods of optical gaging to cut inspection and tool-room costs are covered in 12-page booklet available from Industrial Optical Division, Eastman Kodak Co., 343 State St., Rochester 4, N. Y.

Aircraft plastics fabrication facilities and experience of Plastic Age Co., are described in brochure being distributed by the firm. Address: 649-657 Arroyo Ave., San Fernando, Calif.

The New Way to Solder explains resistance soldering and its uses in production and maintenance. Ask for Bulletin 105-D from Wasserlein Mfg. Co., Inc., 126 W. Cass St., Joliet, Ill.

Custom molded nylon plastics parts, including tables showing mechanical, thermal, electrical and other properties of this material, are described in Bulletin CDP-654 available from General Electric Co., Chemical Division, Pittsfield, Mass.

Production Through Research is a spiral-bound, well-illustrated brochure issued by Rheem Mfg. Co.'s Aircraft Division to describe the research, development and production facilities it offers the industry, particularly firms in defense work. Write Rheem Mfg. Co., Aircraft Division, 11711 Woodruff Ave., Downey, Calif.

Hardness conversion tables for steels are on a wallet-size celluloid card providing approximate relationship between Brinell, DPH (Vickers), Rockwell and Shore Scleroscope hardness values and corresponding tensile strengths of steels. Data comes from SAE handbook. Write International Nickel Co., Inc., 67 Wall St., N. Y. 5, N. Y.

Carbide-tipped circular saw blades and cutting tools and application data are covered in 12-page manual being distributed by DeLuxe Saw & Tool Co., 1314 Kinnear Rd., Columbus 8, Ohio.

Utility vise that eliminates a number of holding operations required in setting up work on drill presses, millers, grinders, shapers and other machinery is described in folder available from Brown Engineering Co., Reading, Pa.

Hydraulic drill units are detailed and charts are given for optimum operation in catalog from Delta Power Tool Division, Rockwell Mfg. Co., Dept. DC-H-8, 400 Lexington Ave., Pittsburgh 8, Pa.

Light Ten lathe in bench- and floor-type, and quick-change gear and tool-room models are described in catalog available from South Bend Lathe Works 425 W E. Madison St., South Bend 22, Ind.

Spraywelding equipment and techniques using Colmonoy hard-facing alloys are described in four-page folder available from Wall-Colmonoy Corp., 19345 John R. St., Detroit 3, Mich.

More than 1600 stock seals and special assemblies, also electronic and electrical control systems, test equipment, components, communications equipment line of Sealtron Co., are detailed in 32-page catalog being distributed by the firm. Address is 9701 Reading Rd., Cincinnati 15, Ohio.

New Addresses

George E. Harris & Co., sales engineering representatives for Adams-Rite Mfg. Co., Co-Operative Industries, Inc., and Electr-Snap-Switch & Mfg. Co., has moved its offices to 1734 North Hillside, Wichita 14, Kans.

Brown-Line Corp., Beverly Hills Calif., maker of aircraft fittings, tie-down and materials handling equipment, has opened a Southwest office at 4613½ Cole Ave., Dallas, Tex.

SIMPLICITY in hydraulic pump design is important for these reasons:

The Pesco hydraulic pump is a gear design—the simplest of all hydraulic pumps. There are actually only three moving parts in the pump proper. Fewer moving parts mean—

. . . less chance of pump malfunction
. . . less maintenance
. . . less cost for overhaul
. . . less weight
. . . less noise

plus the EFFICIENCY of "Pressure Loading" which makes possible:

"*Pressure Loading*" is Pesco's exclusive development that *automatically* holds end clearance of gears to a thin film of oil, thereby maintaining the volumetric efficiency throughout the long service life of the pump.

. . . volumetric efficiencies up to 97% over a wide range of temperatures

plus STATISTICAL QUALITY CONTROL which assures:

. . . uniform high quality and performance of each pump
. . . a longer, trouble-free service life

Simplicity of design, *efficiency* of "*Pressure Loading*" and *statistical quality control* in all phases of manufacture, are three important reasons why Pesco pumps are standard equipment on military and commercial aircraft and on many automotive and industrial products. Write today regarding your hydraulic pump requirements.

engineering Pesco production
PRODUCTS DIVISION

BORG-WARNER CORPORATION
24700 NORTH MILES ROAD • BEDFORD, OHIO

Gen. Putt Challenges Avionics Industry

- **To management he looks for adequate production and research facilities; to engineers for improved quality.**
- **Security of U. S. and effectiveness of our military operations depends on satisfactory electronic devices.**

By Philip Klass

Maj. Gen. Donald L. Putt urges avionics and electronics industry managements to push the development of transistors and transistor circuitry, and their use in military equipment, wherever applicable, to improve reliability and to reduce size, weight, and cost.

This is one of many challenges that Gen. Putt, vice commander of USAF's Air Research and Development Command, laid down to the managements of the avionics and military electronics industries.

▶ **What the Military Expects**—Speaking before the professional group on engineering management at the recent national convention of the Institute of Radio Engineers in New York on the subject of "What The Military Services Expect From Engineering Management in the Electronics Industry," Gen. Putt also challenged the industry to:

- **Establish permanent facilities** devoted to solving military electronics problems.
- **Be willing to undertake research** and development programs without requiring assurance of a subsequent long-run production program.

To engineering management, Putt directed these challenges:

- **Improve equipment reliability.**
- **Recommend simplification.**
- **Design for easy maintenance.**
- **Develop new manufacturing techniques.**
- **Provide test equipment and handbooks on time.**

▶ **No Lack of Appreciation**—"There is no lack of appreciation . . . for the tremendous job you have already performed," Putt said, emphasizing that specific criticisms did not apply to all of the industry. Nor did he deny that the military services were sometimes partially responsible for their own problems.

Gen. Putt asked that the industry recognize that "the success of our military operations is almost wholly dependent upon the satisfactory . . . operation of electronic devices." He cited these examples:

- **B-36 bomber.** The lives of 11 crew members and the success of a B-36 mission depend upon the successful operation of 2,100 vacuum tubes and thousands of associated avionic components and parts. These devices perform a multitude of vital tasks from the moment of takeoff until the final landing. They provide airplane stabilization, are used to navigate, to detect and shoot down enemy fighters, to aim and guide the bomb to its target, and to bring the plane in for a landing in any kind of weather.
- **Interceptors.** The interceptors of the near future will have automatic avionic devices which take over once the plane is airborne. Ground radar will automatically direct the plane to the vicinity of the target at which point the interceptor's own radar fire-control system will then take over to put it on a pursuit course.

When the target is within firing range, the avionic equipment will automatically aim and fire the weapons and then maneuver the interceptor to avoid collision with the target. Avionic equipment will then automatically fly the interceptor to its base and bring it in for a landing. The pilot will take over only in the final moments of the landing.

▶ **Challenge to Top Management**—To meet the military electronics needs of the future, ARDC's vice commander called on top management to build facilities devoted permanently to military electronics programs. He also called for "well-laid plans for conversion of . . . commercial capacity to defense work if and when required." Putt noted that "unless military requirements are completely fulfilled in this day of the atomic bomb, commercial business . . . (could) disappear in an instant."

The "reluctance of some segments of industry to undertake military research and development work without the assurance . . . of a long production run to follow immediately" is causing grave concern among the military, according to Putt.

He asked management to recognize that many research and development programs go far beyond the present frontiers of technical knowledge. This means that some programs will end in failure, making subsequent production impossible.

▶ **Reliability Challenge**—Putt called for

About Gen. Putt

Maj. Gen. Donald L. Putt, vice commander of the Air Research and Development Command, entered military service as a second lieutenant in September 1929. In October he was assigned to the 17th Pursuit Squadron at Selfridge Field. He attended a number of service and civilian technical schools, receiving a Master of Science degree in aeronautical engineering from California Institute of Technology in 1938.

He was named assistant chief of staff for intelligence at AMC headquarters, Wright-Patterson Field in October 1945, and became deputy chief of the Engineering Division there in December. He was appointed director of research and development in the Office of the Deputy Chief of Staff for Materiel at Air Force Hq. in September 1948, and remained as director when this directorate was transferred to the Office of the Deputy Chief of Staff for Development in January 1950.

He became assistant deputy chief of staff for development, and later acting deputy chief, in 1951. In January 1952 he was named commanding general of the Wright Air Development Center of ARDC.

much greater equipment reliability, pointing out that failures in certain avionic equipment several years ago had at that time seriously jeopardized one of the Air Force's most important operations. (This was probably a reference to the difficulties experienced when the new K-type radar-bombing system was first introduced on the B-36). Most of these failures were due to unreliable vacuum tubes, Putt said. He called for "higher quality components whatever the cost."

"Since we know that we can never achieve 100% reliability, our next need is maintainability," Putt said. Maintainability, he added, influences the cost of the overall military establishment, determining the quantities of materiel that have to be procured to sustain a given military force and effort.

▶ **Attention to Packaging**—Gen. Putt called on engineering management to give personal attention to the problem of improved component packaging as one means of simplifying maintenance.

He urged the use of plug-in and/or throw-away units with built-in indicators wherever possible to show whether the component is functioning properly. (A "throw-away" unit is a sub-assembly which normally is filled and sealed with a plastic making field repair impossible.

The speaker cautioned that engineering management must study the "economics" of each equipment and component before deciding whether throw-away component construction is feasible.

This study must take into account the added problems of supply and warehousing and possible savings in manpower and overhaul facilities. The study, Putt said, should include discussions with the military project engineers so that all factors may be considered.

Equipment must be designed to permit maintenance by persons with a minimum of experience and training, Putt said. He also urged that the equipment be designed to require a minimum of maintenance in the forward areas so that the more complex work could be performed by experts in rear areas. Putt suggested that rear zone maintenance could be performed by the equipment manufacturer.

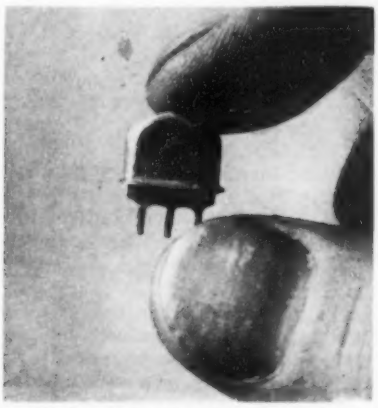
▶ **Recommend Simplicity**—ARDC's vice commander admitted that "the military have gone overboard at times in complicating military specifications and at other times have been guilty of knob-polishing."

But the military wants "the simplest equipment . . . that will assure our weapons' superiority . . . ," Putt said. "Our problem is to determine at what point the . . . effectiveness (of a weapon) per unit cost (and complexity) begins to decrease."

Putt urged engineering management to point out to the military all unwarranted complexity and to expend more effort in simplifying complex equipment.

Producibility has not been as serious a problem in the electronics industry as in the aircraft and aircraft engine industry, Putt said, but he felt that not enough had been done in the research and development of new manufacturing methods, techniques, processes and materials.

This was partly the fault of the mili-



TRANSISTOR development to reduce size of military avionics is urged by Gen. Putt.

NEWS Edo NOTES

CESSNA 170

PIPER PACER

CESSNA 180

PIPER SUPER CUB

EDO FLOAT PRODUCTION STEPPED UP

The 1953 models of both Cessna and Piper make exceptionally fine seaplanes when installed on Edo floats. Advances in aerodynamic design, addition of flaps, higher power and generally improved performance have meant seaplanes of unusual utility, load-carrying ability and generally excellent water handling characteristics.

To meet the demand which the increased use of these airplanes on water has created, Edo has stepped up commercial float production 50% above a year ago. As a result virtually immediate delivery can be made on most Edo float models.

For 28 years, Edo all-metal floats have been known throughout the world for the quality of their workmanship, their rugged construction, and ideal performance. In Canada: McDonald Brothers Aircraft, Winnipeg.

Edo Since 1925 CORPORATION COLLEGE POINT, NEW YORK

Here are the KEYS to

MORE PRODUCTION

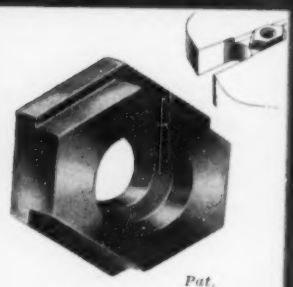
VLIER FIXTURE KEYS

In these simple tools you find the answer to eliminating fixture and key rework, faster production and less idle machine time.

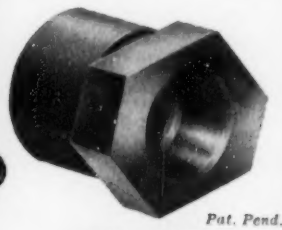
VLIER Multi-dimensional Fixture Keys are counter-bored nuts that are milled to different cross-dimensions. With these keys on your fixtures, a job can be worked on any idle machine without loss of time. Accuracy is guaranteed to ± .0005" and there is a type to meet your needs in the VLIER line.

MILLED SLOT FIXTURE KEYS

This type is designed to fit all standard table slots. Since each key fits three table slot dimensions, many combinations are possible. To use, simply loosen cap screw, rotate to desired dimension, tighten and you are ready to go. Available in six sizes or special sizes on request.



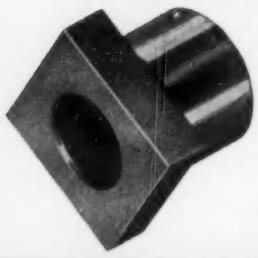
Pat.



Pat. Pend.

REAMED HOLE FIXTURE KEYS

For use where the economy of reamed hole installation instead of milled slots in the fixture is desired without sacrificing accuracy. Supplied in four sizes and three types . . . hex, rectangular or square.



VLIER Fixture Keys are widely used throughout all industries. It will pay you to investigate their money-saving possibilities.

Send for Catalog No. 50

VLIER ENGINEERING, INC.

4552 BEVERLY BLVD · LOS ANGELES 4, CALIFORNIA

Distributors of Spring Plungers, Torque Thumb Screws, Toggle Pads, Spring Stops.

tary, the general admitted and said that corrective steps were being taken to improve the situation. He called for more effort on producibility in order to assure equipment on time and to hold equipment costs to an irreducible minimum.

► **Critical Problem**—Putt termed the military's extreme difficulty in obtaining test equipment, technical data, and operating instructions on time and in the quantities needed, a "most critical problem." Government procedures and procurement practices may be at fault, Putt said, "but we need the assistance of industry to develop and supply this operating information and test equipment as required."

Digressing from his prepared paper, General Putt called on engineering management to provide the military with realistic schedules for research and development and for production programs.

He pointed out that the delay of a single piece of avionic equipment can hold up an entire airplane production program.

Following the formal presentation, a questioner from the floor asked Gen. Putt how a manufacturer could afford to give realistic schedules in proposals and quotations when faced with less scrupulous competitors. Putt admitted that he had no solution to the problem unless all of industry submitted realistic schedules.

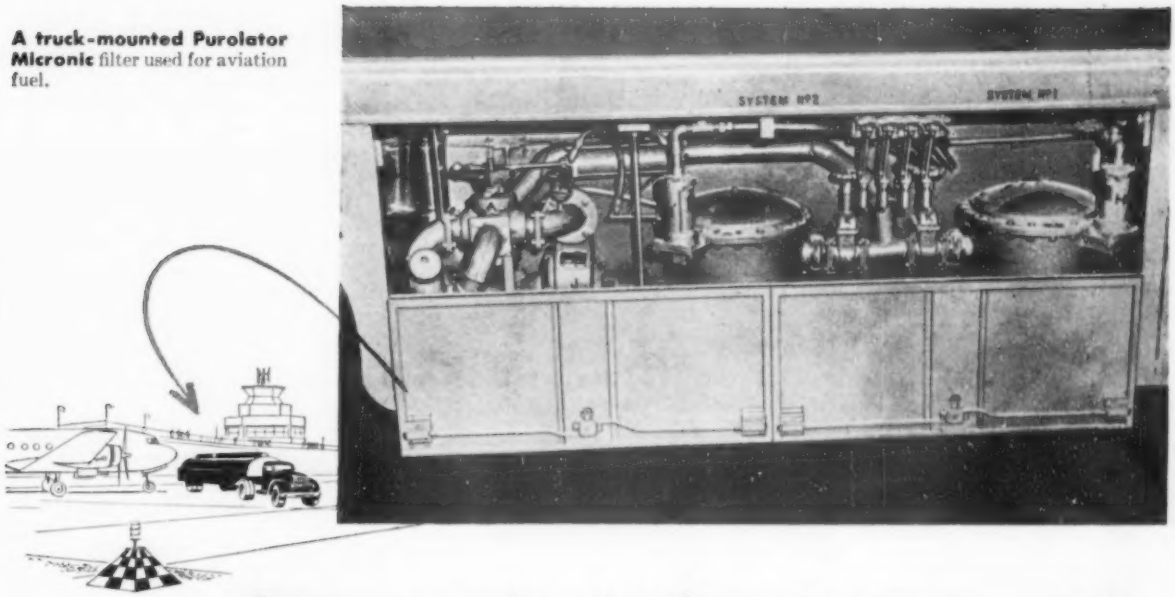
► **More Miniaturization**—Recognizing the considerable progress that has been made in miniaturizing avionic equipment, Putt called for much more progress in reducing size and weight for the supersonic aircraft and guided missiles of the future.

"The transistor holds tremendous promise for achieving improvement beyond anything else appearing on the development horizon," Putt pointed out.

"Not only is there large payoff in achieving minimum size, weight, cost, and power requirements, but likewise great gains in reliability and ruggedness of equipment appear possible." The general urged that "engineering management concentrate maximum efforts wherever applicable to the further development and refinement of transistors in general, development of circuitry and the application of transistors to military electronic equipment."

► **Final Challenge**—Gen. Putt called on the industry to insure that the military is provided with superior and reliable electronic equipment, in proper quantities at the proper time, complete with testing equipment, technical information and operating instructions.

"We want you men of engineering management to appreciate your responsibility for the success of our military weapons," Putt concluded.

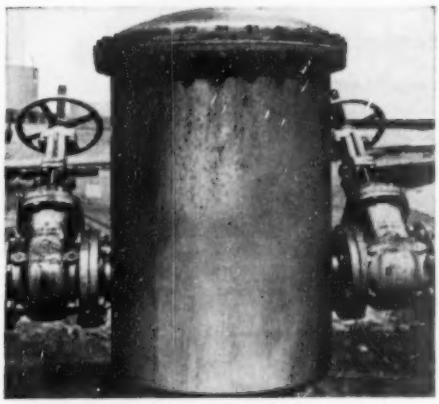


A truck-mounted Purolator Micronic filter used for aviation fuel.

Stop trouble before it starts with—

PurOlator Filters

for bulk fuel handling



A Purolator filter, pedestal type, for large capacity fixed installations. Standard models are available with flow rates of 300 to 1500 g.p.m., handling light petroleum products.

EXPERIENCE HAS SHOWN that most troublesome fuel contamination occurs *after* the product has left the refinery storage tank.

Protect *your* customers—and insure continuing good will—by installing efficient Purolator* Micronic filters at tank outlets and on delivery trucks. Purolator units give excellent service in the high-flow filtration of gasoline, kerosene, fuel oil and diesel fuel.

Famous Purolator Micronic* filter elements, remove particles as small as 5 microns in size, have up to 12 times the filtering area and dirt storage capacity of ordinary filters.

Send for your copy of the new Purolator Industrial Catalog No. 1053, describing filter units with flow capacities of 15 to 1500 gallons per minute.

*Reg. U. S. Pat. Off.

PUROLATOR
WORLD'S FINEST OIL FILTER

PUROLATOR PRODUCTS, INC.
Rahway, New Jersey and Toronto, Ontario, Canada
Factory Branch Offices: Chicago, Detroit, Los Angeles

Avionics Companies Add More Space

Recent expansions in the avionics industry include addition of more space by established manufacturers and formation of new facilities in the east and west.

• **Aircraft Engineering & Maintenance Co.** of Oakland, Calif., has established an electronics division for research, development, and production of component parts for electronic and avionic devices. Approximately 100,000 sq. ft. of the company's 621,000-sq. ft. plant at Oakland airport will be used for the new operation.

• **G. M. Giannini & Co.** has started construction on a new instrument assembly plant at 55 N. Vernon, Pasadena, Calif. Giannini builds precision instruments for aircraft and for guided missiles.

• **Polarad Electronics Corp.** has added 20,000 sq. ft. of working area in a new plant located at 2 Franklin Ave., Brooklyn, N. Y. Polarad manufactures microwave test equipment.

• **Air-Marine Motors, Inc.** of New York has opened a manufacturing and engineering facility at 2233 Federal Ave., Los Angeles, to produce motors, fans, and blowers for West Coast avionic manufacturers.

ONE OUT OF MANY: Flip-flop unit, upper center, is made up from all the other parts shown.

Plug-in Circuits For Easier Design

Equipment engineers can choose from a growing selection of packaged plug-in vacuum tube circuits, which can save much design time. Each single plug-in unit contains a vacuum tube and all associated resistors, capacitors, etc.

New lines of such units have been announced recently by two manufacturers. The units and their makers:

• Twenty-six basic types and 40 secondary versions are offered by Electronic Engineering Co. of California. The types include amplifiers, flip-flops, multivibrators, squaring circuits, pulse gates, crystal oscillators, "and" circuits, "or" circuits, and pulse amplifiers. Information is available from T. E. Coalson, Plug-In Div. of the company, 180 S. Alvarado St., Los Angeles 4, Calif.

• Blocking oscillators for 0.1-sec. pulses with a 2.0-sec. rise time, or 2.0-sec. pulses and 0.4-sec. rise time are available from the Electronics Div. of American Machine & Foundry Co. AMF says that use of ferrite core in transformer permits high peak currents and allows faster pulse rise time. The company's address is Boston, Mass.

Resonance Meter For Avionic Impedance

A new portable resonance meter suitable for measuring the impedance of aircraft antennas and feed lines has been announced by Oregon Electronics Mfg. Co.

The device, essentially a grid-dip meter, can measure impedance in the range of 50 to 500 ohms and inductances of 0.01 to 100 μh. Plug-in attachments enable the device to generate precise marker frequencies between 2.4 and 205 mc. An RF probe

for Optical Tooling - - -

FENNEL INSTRUMENTS

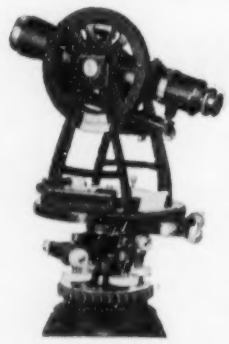
of precision and quality

strongly built to hold adjustments

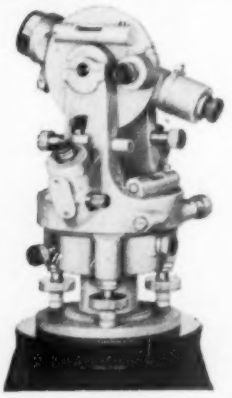
Fennel Instruments have perfect optical and mechanical alignments. The patented liquid of bubble vials is not susceptible to temperature changes.

For general information, prices and fast economical repair service on all makes of surveying instruments communicate with

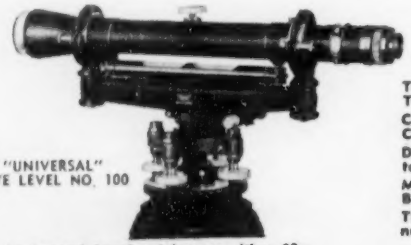
FENNEL INSTRUMENT CORPORATION OF AMERICA
478 Water St., New York 2, N. Y.



"6¼" TRANSIT
The "Favorite" Transit is preferred for Federal and Public Works, by General Engineering, Railroads and Road Building Engineers.



"THEMI"
THEODOLITE NO. 120
The most accurate and quickly read transit in the world.



"UNIVERSAL"
WYE LEVEL NO. 100
An internal focusing telescope with a 32x magnifying power.

DEALERS

The L. Beckmann Co., 1609 Canton Street, Toledo 2, Ohio
Crofoot, Nielsen & Co., 205 Wacker Drive, Chicago 6, Ill.
D & W Blue Print Co.,16 Perry Street, Trenton, New Jersey
Modern Blue Print Co., 47-51 Cornhill, Boston, Mass.
The Ostermann Co., 2222 Woodward Avenue, Detroit 1, Mich.

AND OTHERS

"NITAC" LEVEL NO. 24
The only level of its kind with split bubble, erect image, visible through direct line of sight.

NOW! simplify fuel tank repair jobs with easy-to-use 3M sealant kit

Yes, now you can seal integral fuel tanks quickly, easily and effectively . . . and you can fulfill many small quantity production line uses . . . with 3M's new Quick Repair Sealant Kit.

Designed expressly for this vital assignment, 3M's Sealant Kit complies with MIL-S-7502, which supersedes Air Force Specification 14153 and Air Force Technical Order 01-1-3.

For more detailed information on 3M's Quick Repair Sealant Kit, its preparation and application . . . for additional information on other 3M products made for the aircraft industry, consult with your 3M sales representative. There's one located near your plant. Call him in, or write directly to 3M, Dept. 114A, 411 Piquette Avenue, Detroit 2, Michigan.

3M COMPANY

SEE HOW EASY IT IS TO MAKE QUICK REPAIRS WITH 3M'S SEALANT KIT

1 Use the spatula to stir the accelerator (small jar) to a creamy paste.

2 Scrape ALL the contents of the small jar into the large jar (sealant).

3 Mix the accelerator and the sealant in the larger jar with the spatula.

4 To obtain uniform dispersion, stir for approximately 15 minutes.

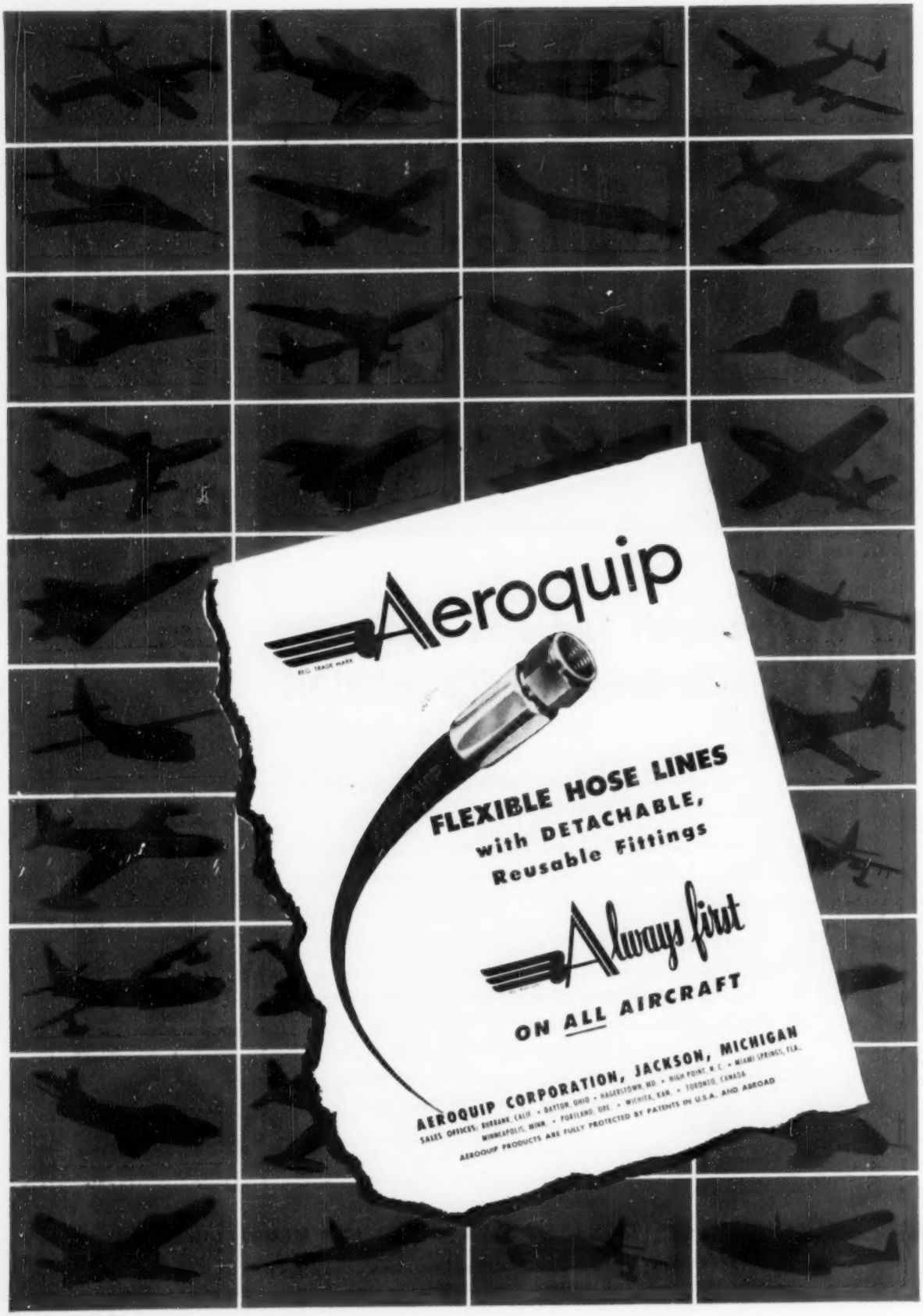
5 Sealant may readily be applied to a surface that is chemically clean.

6 Sealant must be topcoated. 3M's EC-776R fills Spec. MIL-S-8343.

ADHESIVES • COATINGS • SEALERS
for the Aviation Industry

MINNESOTA MINING AND MANUFACTURING COMPANY
ADHESIVES AND COATINGS DIVISION • 411 Piquette Ave., Detroit 2, Michigan
GENERAL SALES OFFICES: ST. PAUL 6, MINN. • EXPORT: 122 E. 42 ST., N.Y. 17, N.Y. • CANADA: LONDON, ONT.

MAKERS OF "SCOTCH" BRAND PRESSURE SENSITIVE ADHESIVE TAPES • "SCOTCH" BRAND SOUND RECORDING TAPE • "SCOTCHLITE" BRAND REFLECTIVE SHEETINGS • "3M" ABRASIVE PAPER AND CLOTH • "3M" ADHESIVES AND COATINGS • "3M" ROOFING GRANULES • "3M" CHEMICALS


Aeroquip
REG. TRADE MARK
FLEXIBLE HOSE LINES
with DETACHABLE,
Reusable Fittings
Always first
ON ALL AIRCRAFT
AEROQUIP CORPORATION, JACKSON, MICHIGAN
SALES OFFICES: BURBANK, CALIF. • DAYTON, OHIO • HAGERSTOWN, MD. • HIGH POINT, N. C. • MIAMI SPRINGS, FLA.
MINNEAPOLIS, MINN. • PORTLAND, ORE. • WICHITA, KAN. • TORONTO, CANADA
AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

with built-in d.c. amplifier permits the measurement of closely shielded circuits. Unit weighs 14 lb.

Oregon Electronics Mfg. Co., 2232 East Burnside, Portland 15, Ore.

Lab Testing Gets New Equipment

Newly developed electronic instruments for laboratory testing or measurement include audio oscillators, wattmeters and phase meters. These units have been announced recently:

• **Audio oscillator.** Especially useful for checking FM/FM telemetering subcarrier equipment, the Model TO-100 oscillator has 20 fixed center-frequencies between 400 and 70,000 cps., with other frequency ranges between 200 and 100,000 cps. available on special order. Individual frequencies are selected by pushbuttons and can be varied 10% with a calibrated control. Frequency accuracy is reported at ±1% and maximum distortion at full output at less than 1%. Dept. AW, Teletronics Laboratory, Inc., 54 Kinkel St., Westbury, N. Y.

• **Electronic wattmeter.** Model 110 can measure power of 0.3 to 300 watts, or up to 9,000 watts with accessory shunts, at frequencies of 20 to 3,000 cps. Accuracy is 2% of full scale and input impedance is 500,000 ohms to the potential circuit, 0.5 to the current circuit, according to the manufacturer, Keithley Instruments, 3868 Carnegie Ave., Cleveland 15, Ohio.

• **Phase meter.** Model 404A provides direct indication of phase angle between two a.c. voltages of either symmetrical or unsymmetrical wave form at frequencies of 0.001 cps. to 100 kc. or down to zero cps. with an external meter. Input voltage range is 0.5 to 300 and accuracy is ± 1% to 10 kc., increasing to 4% at 100 kc. with external indicator, according to manufacturer, Advance Electronics Co., P. O. Box 394, Passaic, N. J.

FILTER CENTER

▶ **Northwest Tries Collins IFS**—Northwest Airlines has installed a Collins Radio integrated flight system (flight director) on a Boeing Stratocruiser for evaluation. Installation includes newly developed three-inch-diameter course indicator.

▶ **New Fire-Retardant Textolite**—General Electric has developed a new laminated plastic which offers increased protection against fire due to short circuits in avionics equipment. Designated GE 11542 Textolite, the new material is self-extinguishing in one minute or less, GE says. New textolite reportedly has low moisture absorption and excellent electrical properties. It is available from GE's Chemical Dept. in thickness of 0.015 to 0.25 in.

▶ **TCA to Try Wilcox CAT**—Trans-Canada Air Lines is planning to install one of the recently announced Wilcox Electric computing automatic trackers (CAT) on a DC-3 for evaluation. The Wilcox CAT, a simplified flight director for ILS approaches, is now in operation on many Eastern Air Lines transports (Aviation Week Apr. 20, p. 55).

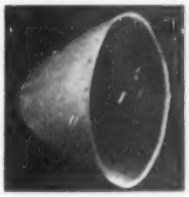
▶ **Study Polar Communication Blackouts**—The University of Alaska is gathering data and studying the communication blackouts frequently encountered in the polar regions in the hope of being able to predict their occurrence, according to Col. Bernt Balchen, noted polar flier.

▶ **Berkeley to Distribute Digitizer**—Berkeley Scientific Division of Beckman Instrument Co., Richmond, Calif., has been named distributor for "digitizers" manufactured by Coleman Engineering Co. of Los Angeles. Digitizers are used to convert computer or sensing element voltages from analog into digital form.

It's HEXCEL HONEYCOMB in the F86D!

Hexcel GLASS FABRIC Honeycomb PRE-SHAPED to speed fabrication!

TAPERED-CUT to give optimum radar transmission!



Thirteen pre-curved "orange peel" sections and one nosepiece are furnished for each radome in production of North American Aviation's great F86D All-Weather Interceptor. Pieces are ready for immediate layup when received by fabricator. Waste trim is eliminated.

Hexcel ALUMINUM Honeycomb used in trailing edges, access doors and other parts on F86D!

Now available in ⅛" CELL SIZE giving substantially 100% bond area.

Interested in Sandwich Structures?

WRITE HEXCEL PRODUCTS CO.

Distributors of Honeycomb • Manufactured by California Reinforced Plastics Company

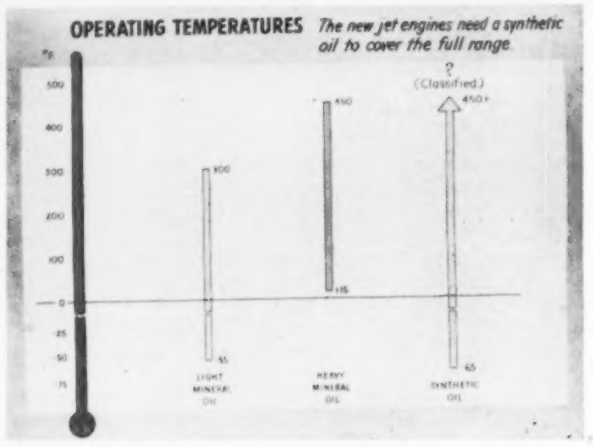
955 Sixty-First Street • Oakland 8, California

North American Aviation Company's F-86D Sabre Jet All-Weather Interceptor, designed expressly for radar interception and firing of the new 2.75 "Mighty Mouse" Aerial Rocket.

Photograph courtesy of North American Aviation Company

Hexcel

STRUCTURAL HONEYCOMB in ALUMINUM GLASS FABRIC • STAINLESS STEEL • COTTON FABRIC



New Oil Will Take Hotter Jets Higher

Esso's synthetic resists altitudes and temperatures that make conventional mineral lubricants wilt.

By George L. Christian

A new synthetic jet engine lubricant, possessing a combination of properties said to be unobtainable in a single mineral oil, was recently taken from under security wraps (AVIATION WEEK Apr. 13, p. 7).

Standard Oil's Esso Aviation Turbo Oil 15 has a temperature range wider than any single petroleum lubricant.

- It can be flown to much higher altitudes before boiling at high temperatures, yet it remains fluid at arctic temperatures.
- Its load-carrying capacity is four times that of light mineral oil.
- The new oil resists heat-caused decomposition and formation of coke-like deposits better than mineral oils. This is particularly important because of considerable heat soak-back in jet engines after shut-down. Although operating oil temperatures seldom exceed 482F, soak-back temperatures may climb to 572F. Coke deposits can plug oil passages and filters, causing oil starvation.

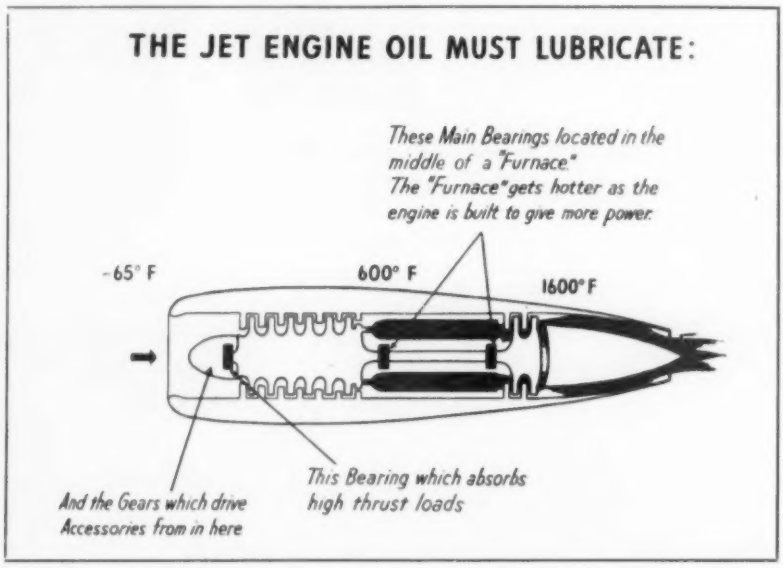
► **First to be Approved**—EATO 15 is the first and (until now) the only synthetic lubricant to be approved under U. S. Military Specification MIL-L-7808 for synthetic jet engine lubricants, according to Standard Oil officials. They add that it is the only oil now recommended for Wright Aeronautical's J65 Sapphire for its complete range of power settings. The new lubricant comes from the Standard Oil Development Co., central research and engineering affiliate of Standard Oil (N. J.).

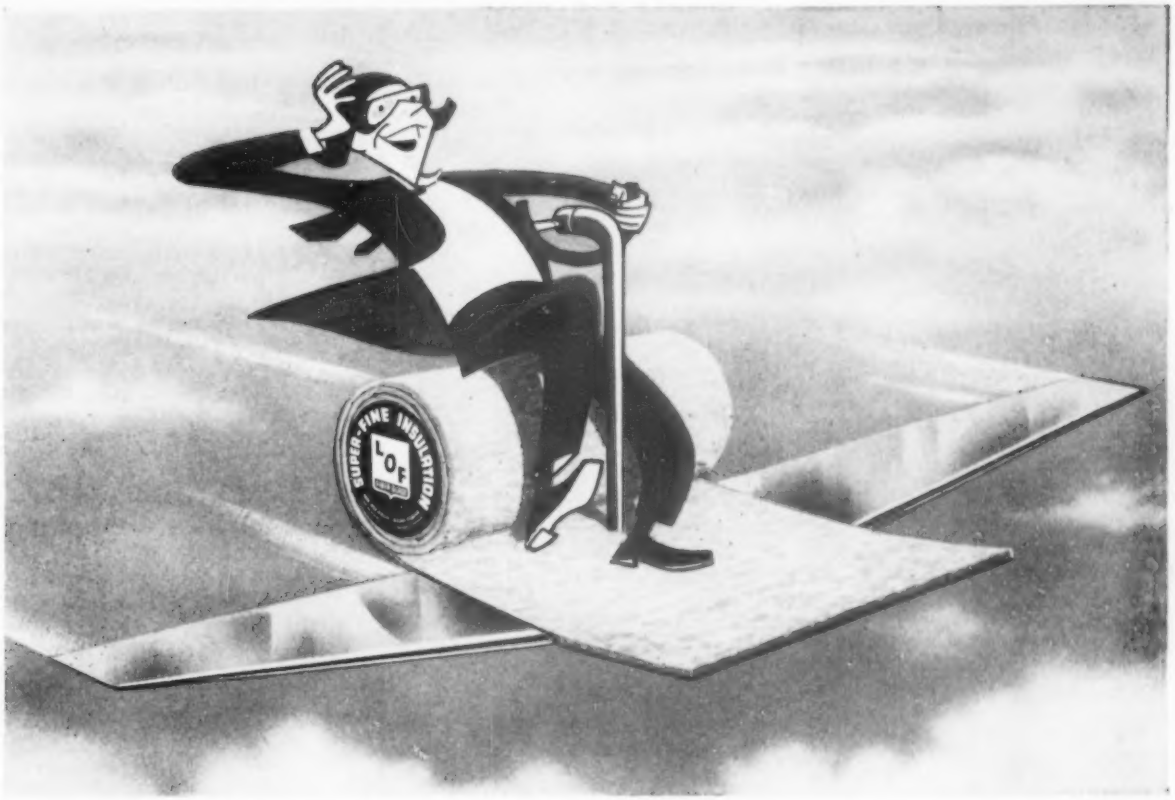
A similar oil, Esso Aviation Turbo Oil 35, was developed in parallel in England by the Esso Development Co., Ltd. This oil has given satisfactory performance in all British turbojet and turboprop engines, say Standard spokesmen. Moreover, they state that the latest marks of Rolls-Royce Avon and Armstrong Siddeley Sapphire axial-flow turbojets cannot be operated under design conditions on any other lubricant.

Considerable quantities of the components used in the manufacture of EATO 35 are being exported for use in U. S. Esso developments, the British firm states.

► **Put Through Paces**—A recent demonstration of EATO 15 showed these qualities:

- **Hotter and higher.** Heated to 450F, temperature to be expected at a jet engine's rear bearing near the turbine, the new oil resisted altitudes of 80,000 ft. before giving any signs of boiling. The best light mineral oil began to boil at 40,000 ft., and bubbled furiously at 50,000 ft. Under actual flight conditions, boiling means excessive oil consumption and inadequate lubrication.
- **Colder and thinner.** Engine oil is


THE JET ENGINE OIL MUST LUBRICATE:
These Main Bearings located in the middle of a "Furnace."
The "Furnace" gets hotter as the engine is built to give more power.
-65° F
600° F
1600° F
This Bearing which absorbs high thrust loads
And the Gears which drive Accessories from in here



How L·O·F flightweight insulating blankets cut weight, save fuel, boost payload

L·O·F Super·Fine Fiber·Glass blankets provide excellent sound and thermal insulation for your aircraft.

These extremely lightweight blankets add very little to your flight load. And, because you do the same insulating job with less thickness of Super·Fine than with many other materials, you gain space, increase payload weight and capacity.

The fine glass fibers will not burn, absorb moisture, support fungi, mildew or rot. Only inorganic fibers, of which Super·Fine is composed, have *all* these qualities. Super·Fine is a superior insulation in its resistance to heat flow.

Super·Fine is lightweight. One sq. ft. of .6 pound density and one-half inch thickness weighs only .4 of one ounce. Properly applied, Super·Fine will not shake down or pack under ordinary vibration. And L·O·F Super·Fine meets all applicable commercial and Government standards.

Get details from your nearest L·O·F office (offices in 26 major cities). Or write Libbey·Owens·Ford Glass Company, Fiber·Glass Division, 3043 Wayne Building, Toledo 3, Ohio.

L O F GLASS PLASKON FIBER·GLASS

LIBBEY·OWENS·FORD GLASS COMPANY
FIBER·GLASS DIVISION

FIBER·GLASS

ENGINEERS
AND
SCIENTISTS

You are invited to write regarding long-range projects at Northrop Aircraft, Inc. Exceptional opportunities now exist to join the company's engineering and scientific staff. If qualified, you may select important developmental work, or equally vital production engineering.

Examples of positions open:

BOUNDARY LAYER RESEARCH SCIENTISTS
ELECTRONIC PROJECT ENGINEERS
ELECTRONIC INSTRUMENTATION ENGINEERS
RADAR ENGINEERS
FLIGHT-TEST ENGINEERS
STRESS ENGINEERS
AERO- AND THERMODYNAMICISTS
SERVO-MECHANISTS
POWER-PLANT INSTALLATION DESIGNERS
STRUCTURAL DESIGNERS
ELECTRO-MECHANICAL DESIGNERS
ELECTRICAL INSTALLATION DESIGNERS
ENGINEERING DRAWING CHECKERS

Qualified engineers and scientists who wish to locate permanently in Southern California are invited to write for further information regarding these interesting, long-range positions. Include an outline of your experience and training. Allowance for travel expenses.

Address correspondence to

Director of Engineering,
Northrop Aircraft, Inc.
1003 E. Broadway, Hawthorne, Calif.

Performance of Lubricants in Advanced Design Turbojet Engines*

Lubricant	Mineral Oil	Ester-Type Synthetic Oil		
	Grade 1010	A	B	C
Viscosity at 210F, cs	2.5	7.9	3.6	3.1
Gear and bearing lubrication	Some scuffing and wear	Excellent	Good	Acceptable
Oil consumption	High to excessive	Low	Low	Low
Deposits and corrosion	Medium to heavy deposits, no corrosion	Light to medium deposits, no corrosion	Light to medium deposits, no corrosion	Light to medium deposits, no corrosion
Low temperature pumpability limit	−40 to −65F	−40F	−50 to <−65F	—

* *SOURCE: Performance of Turbo Engine Synthetic Oils, by Crampton, Gleason, Lifson and Pennekamp of Esso Lab's Research Division.*

Performance of Lubricants in Advanced Design Turboprop Engines*

Lubricant	Mineral Oil		Ester-Type Synthetic Oil	
	Grade 1100	MIL-O-6081 Grade M Mild E.P.	A	B
Viscosity at 210F, cs	20.5	8.6	7.9	3.6
Gear and bearing lubrication	Good	Good	Good	Some gear scuffing to acceptable
Oil consumption	Low	Low	Low	Low
Deposits and corrosion	Medium to heavy deposits, no corrosion	Heavy deposits, some corrosion	Light to medium deposits, no corrosion	Light to medium deposits, no corrosion
Low temperature pumpability limit	+30	—	−40	—

* *SOURCE: Performance of Turbo Engine Synthetic Oils, by Crampton, Gleason, Lifson and Pennekamp of Esso Lab's Research Division.*

Properties of Aircraft Engine Oils*

Property	Synthetic Oils			Mineral Oils	
	A	B	C	1010 Jet Engine Oil	1100 Piston Engine Oil
Viscosity at 210F, cs	7.9	3.6	3.1	2.5	20.5
Gear scuff load, % of Grade 1100 oil	105	60	45	<15	100
Flash point, °F	450	430	400	295	485
Relative evaporation rate at 400F, % of Grade 1010	2	3	10	100	
Oxidation-corrosion stability at 347F	Stable, non-corrosive	Stable, non-corrosive	Stable, non-corrosive	Unstable, corrosive	Unstable, corrosive
Temperature range for 5,000 to 20,000 cs. visc., °F	−25 to −45	−55 to −70	−60 to −75	−45 to −60	+5 to +30

* *SOURCE: Performance of Turbo Engine Synthetic Oils, by Crampton, Gleason, Lifson and Pennekamp of Esso Lab's Research Division.*

required to be fluid enough at −65F to be picked up by pumps and forced through lubrication passages in the engine the instant the powerplant is started, for immediate protection of all bearings. Standard scientists used a cold box refrigerated to that temperature and an electrically driven stirrer for the cold tests.

Heavy mineral oil was completely

solidified at −65F. Light mineral oil and EATO 15 were still fluid. When the stirrer, which rotated at 400 rpm. under no load, was immersed in the light mineral oil, it slowed down to approximately 150 rpm. But when the stirrer was switched to the synthetic oil, it was retarded only to 200 rpm., showing that the synthetic lubricant was more fluid than light mineral oil at this low temperature.

• **Stronger and tougher.** Load-carrying characteristics or lubricity (the ability to maintain a film of oil between two pieces of metal under pressure) of EATO 15 and light mineral oil were compared on an Almen lubrication tester. Weights were added to arm of the tester at a rate of one every ten seconds. When rotating test shaft was lubricated with light mineral oil, the addition of the third weight created enough friction to break the shaft. With synthetic lubricant, seven weights were added before the shaft broke, indicating that the new oil could carry a considerably larger load than the light mineral oil.

▶ **Viscosity**—Here is how the synthetic lubricant stacks up against conventional mineral aviation oil of 100 seconds viscosity at 100F:

• **EATO 15** has a viscosity of 15 centistokes.

• **EATO 35** (the British formulation) has a viscosity of 35 centistokes.

• **Conventional mineral oil** has a viscosity of 235 centistokes.

Although the synthetic lubricants are light enough to remain fluid at low temperatures that completely congeal 100-seconds mineral oil, their lubricity exceeds that of mineral oils at high operating speeds and temperatures.

Importance of good lubricity is pointed up by the fact that jet engine accessory power takeoffs may absorb some 100 hp. Of even greater importance is the need for adequate oiling of the propeller drives on turboprop engines which transmit several thousand horsepower.

By incorporating suitable inhibitors, synthetic oils can have considerably better high-temperature oxidation-corrosion stability than jet engine mineral oils. Laboratory tests at 347F have shown that synthetic oils are stable, non-corrosive, and 1010 jet engine oil and 1100 piston engine oil are unstable, corrosive.

▶ **Problem of Seals**—One present drawback of synthetic oil lubricants is their effect on sealing materials. Synthetic rubber seals used with conventional mineral engine oils deteriorate badly when used with synthetic oils, especially at high temperatures.

New seals, capable of being used with the synthetic oils are being developed.

▶ **Built From Esters**—Standard Oil sci-

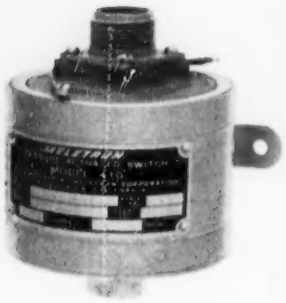
Northrop's Prime Equation

Northrop Aircraft production specialists initiate and install time-saving, cost-saving methods. The "half-shell" assembly technique, illustrated above, permits free installation of equipment in Scorpion F-89 interceptors now in production. Equations are used to solve problems. At Northrop Aircraft, the prime equation combines teams of administrators, outstanding scientists, and production specialists with modern industrial and research facilities. The combination efficiently converts imagination and knowledge into actual matériel of advanced design and incalculable value.

NORTHROP AIRCRAFT, INC.
HAWTHORNE, CALIFORNIA
Pioneer Builders of Night and All Weather Fighters

Every investor in the stock market buys with full knowledge that his securities may appreciate or decline.

we're eliminating chances of failure



*From zero absolute to 12,000 psi gauge.

Aircraft engineers and designers are seeking a similar goal. Unitedly, they agree: *We must eliminate the chances of a failure.* In this quest to prevent the *chance* of failure in systems, Meletron has perfected pressure actuated switches for every requirement.* With these reliable instruments, we are eliminating chances of failure.

MELETRON® CORPORATION

950 NORTH HIGHLAND AVENUE, LOS ANGELES 38, CALIFORNIA

J. M. WALTHEW CO., Boeing Field, Seattle. THOMSON ENGINEERING SERVICE, 708 Hemphill St., Fort Worth and 732 So. Broadway, Wichita. ROUSSEAU CONTROLS Ltd., Montreal Airport, Dorval, Canada. W. M. HICKS & J. A. KEENETH, 29-27 Bridge Plaza North, Long Island City, New York. JOSEPH C. SORAGHAN & ASSOCIATES, 1612 Eye St., Northwest, Washington 6, D.C.

entists say that their new lubricant is entirely synthetic. It is synthesized from "chemical building blocks"—esters in this case.

"The starting materials for producing esters can be obtained from petroleum, although the present product is not yet derived entirely from petrochemicals," Standard Oil says. The company hopes eventually to produce the esters entirely from petroleum. This will allow Standard Oil to increase production and decrease price of the product.

Current cost is considerably above mineral oils—possibly in the $9-$10 a gal. range. Although costs will drop with increased production, even today's high price may prove not too objectionable because of the very low oil consumption of a jet engine—about a quart an hour, according to Standard Oil spokesmen.

The oil is being produced by several Standard Oil plants and current supply equals demand, company authorities say.

► **Manufacturers' Tests**—Much work involved in testing the new synthetic lubricant was done by jet engine manufacturers. The oil has operated in engines on the ground and in flight for more than 10,000 test hours. In the air, this would be equal to more than 6 million engine miles of flying.

Standard Oil Development Co. has been working on the synthetic oil since 1947. It first became commercially available in 1951, and is being used in such jet engines as the J57, J65 and T40 turboprop powerplant.

At the 1952 SBAC display in England, these aircraft engines were lubricated with EATO 35: Rolls-Royce Avons in the Hawker Hunter, de Havilland 110, Vickers Valiant, Supermarine Swift, and English Electric Canberra (with afterburner), Armstrong Siddeley Sapphires in the Gloster Javelin and English Electric Canberra.

Standard Oil's scientists believe that their synthetic oil marks the beginning of a whole new concept in lubricant production and performance. As jet engines get bigger and hotter—and they are bound to—even higher quality lubricants will be required.

"Much remains to be learned in this field," Standard Oil admits, "but one thing is virtually certain—the jet engine lubricants of the future will also be synthetic."

Slip-Tube Joint Uses No Fitting

The possibility of joining aircraft tubing without the use of special fittings is being explored by Vickers, Inc.

In informal tests, Vickers has been

butting the ends of two pieces of tubing and covering the joint with a sleeve of tubing whose inner diameter equals the outer diameters of the pieces being joined. Stainless steel sleeves are silver-soldered in place; aluminum sleeves are attached with a heat-cure adhesive. Vickers points out that elimination of flaring makes the joints extremely strong, and because no fitting is required, both weight and space are saved.

Cycling tests of the slip-joint assemblies at Vickers' Detroit labs have shown these results thus far:

- **2,000-3,000-psi. test rig:**

Stainless steel joint took 3½ million cycles without failure. Joint finally blew at 14,000 psi. pressure.

Aluminum joint has gone through 1,250,000 cycles without failure.

- **0-3,000-psi. test rig:**

Stainless steel joint has been through 203,000 cycles without failure.

Aluminum joint has gone 110,000 cycles without failure.

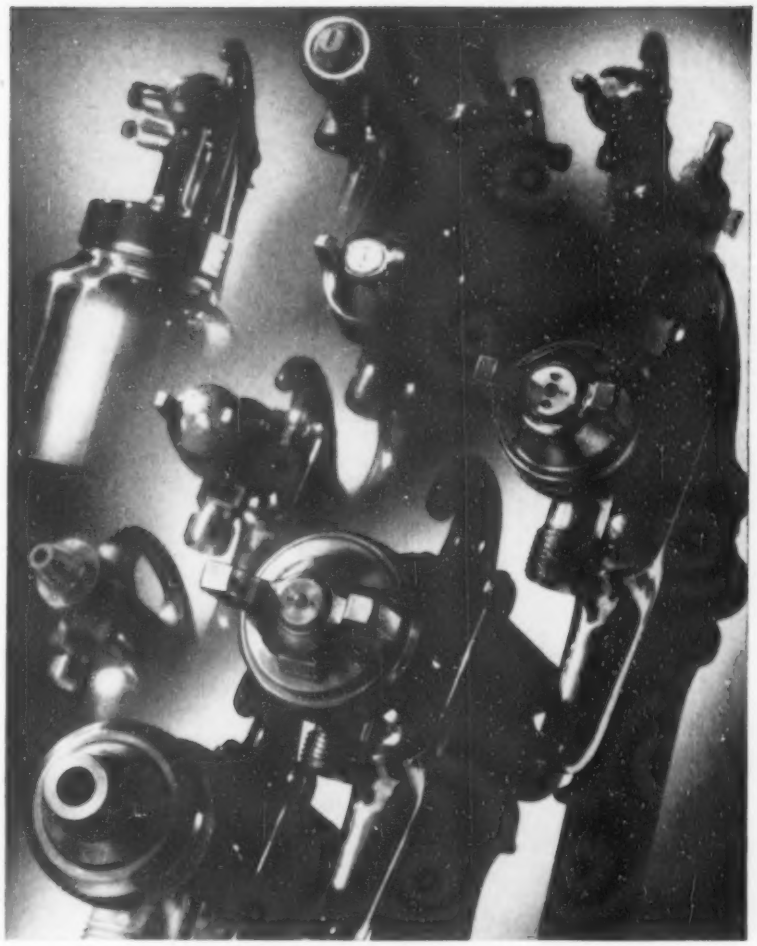
The stainless tubing used by Vickers comes from Superior Tube Co., Norristown, Pa.; aluminum tubing comes from Aluminum Company of America, Pittsburgh, Pa.

Ni-Ca Cells Hit at One Cause of Crashes

The military's interest in long-lived nickel-cadmium aircraft batteries stems in part from the loss of three Grumman F9F Panthers as a result of lead-acid battery trouble, Marine Col. E. C. Best, director of BuAer's electronics division, has told AVIATION WEEK.

The Panther washouts followed this sequence: voltage regulator malfunctions caused batteries to overcharge; electrolyte boiled off; battery plates buckled and contacted each other; direct short that resulted caused complete failure of aircraft electrical system and the planes crashed.

This will be impossible with the



SPRAY GUNS for every purpose and material

Today, thanks to recent developments in spray guns and material handling pumps, you can use spray guns for more jobs than ever before.

For example, the Binks line—in addition to guns for manual application of high-quality aircraft finishes—includes equipment for *automatic* painting of wheels, outer shells for spark plugs, replacement panels, etc....and for spraying heavy materials like dopes, adhesives and insulation directly from the original container.

And this is only a beginning. With 36 gun models and 1050 nozzle combinations currently available, Binks equipment is applying materials ranging from those fluid as water to those thick as tar. So, whatever the finish or coating, Binks can tell you if spraying is possible...and what equipment to use. Send in coupon, or write: Binks Manufacturing Company 3116-30 Carroll Ave. West, Chicago 12, Ill.

For FREE booklet of painting hints, MAIL COUPON!

Binks
EVERYTHING FOR SPRAY PAINTING

Binks Manufacturing Co., 3116-30 Carroll Ave West Chicago 12, Ill.

Gentlemen: Please rush my FREE copy of "SPRAY PAINTING HINTS," the pocket-size guide to overcoming common troubles in spray finishing. I understand there is no obligation.

NAME _____

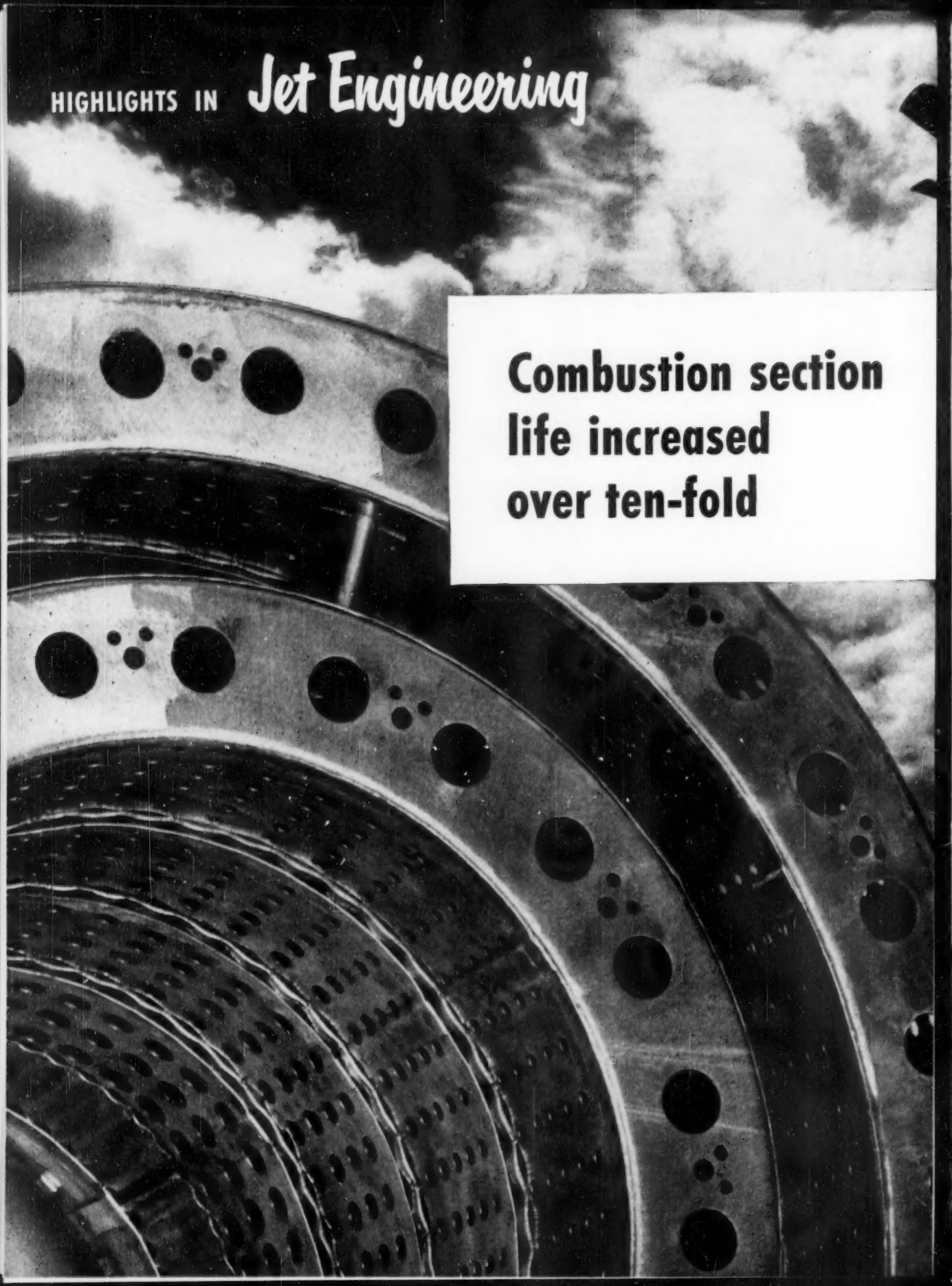
COMPANY _____

ADDRESS _____

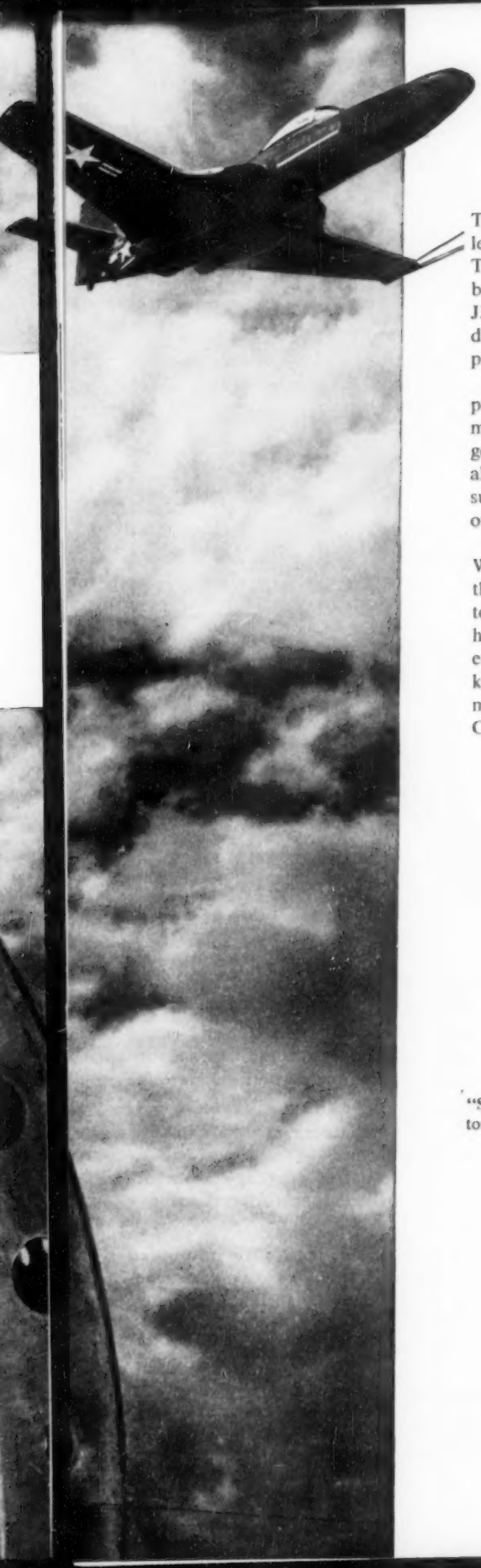
CITY _____ ZONE ____ STATE _____

REPRESENTATIVES IN PRINCIPAL U. S. & CANADIAN CITIES • SEE YOUR CLASSIFIED PHONE DIRECTORY

HIGHLIGHTS IN *Jet Engineering*



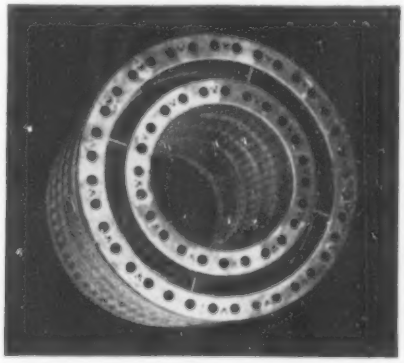
Combustion section life increased over ten-fold



The combustion section of jet engines was given an unprecedented lease on service life with the introduction of the "step wall" liner. The unique design of this combustion chamber liner has proved itself beyond question in the unequaled combat record of the Westinghouse J34 engine. By eliminating severe hot spots and their heavy engine damages, the liner answered one of the most critical of all service-life problems.

The actual design features of the "step wall" liner, a Westinghouse patent, stand out at a glance. In place of the usual cylindrical sheet metal construction, telescopic circular sections have been fitted together. This gives the liner a stepped contour, instead of a flat surface, allowing a continuous blanket of relatively cool air to pass over its surface. The result: protection from the ravages of temperatures over 3000°F.

While the J34 was setting its unparalleled combat records in Korea, Westinghouse engineers were designing another new jet engine, using the "step wall" liner—the J40. Already severe altitude and wind-tunnel tests have been made. Again new records have been set . . . over 700 hours without a major component change. And again Westinghouse engineers have new designs on their drawing boards . . . new plans to keep advancing the jet engineering of today, with an eye to faster, more economical air transportation tomorrow. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-54015



"Step Wall" Liner—Full view of combustion chamber liner shows stepped contour design on both inside and outside sections.

YOU CAN BE **SURE**...IF IT'S

Westinghouse

. . . with Johns-Manville THERMOFLEX BLANKETS

The North American Sabre Jet, powered with the General Electric J47 turbojet engine, has flown through the test of combat with highest honors.

THIS PRODUCTION LINE SCENE in the North American Aviation plant at Los Angeles shows Thermoflex* Insulation Blankets being applied to tail pipes of North American Sabre Jets on order for the United States Air Force.

Now standard protection for many Air Force and Navy jet aircraft, these flexible blankets insulate and protect the airframe against searing heat generated by jet power.

Thermoflex Blankets are custom-fabricated with highly stable Thermoflex RF Felt. Developed by Johns-Manville Research and Insulation Engineers, this time-tested refractory fiber felt is sealed between sheets of corrosion-resistant metal foils. In manufacturing Thermoflex Blankets to specification, careful attention is given to the accuracy of cutouts for engine supports, actuator mountings, fuel lines, thermocouple leads and other controls. The precision-formed grooving and edges of the blanket . . . the close fit at cutouts . . . maintains maximum insulation value for the entire application. Furthermore, edges at cutouts are suitably sealed to prevent fuel penetration into the insulation felt.

In addition to insulating tail pipes, engine cones, turbine casings and afterburners . . . Thermoflex Blankets in special preformed shapes are used to insulate, protect, and fireproof fluid storage tanks, air-conditioning systems, thermal de-icing ducts and many other assemblies in all types of aircraft.

Why not send for your free copy of the illustrated folder IN-136A? It tells the complete story of Thermoflex Blankets for aircraft power plants and airframes. Address Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

*Reg. U.S. Pat. Off.

JOHNS MANVILLE JM PRODUCTS **Johns-Manville** PRODUCTS for the AVIATION INDUSTRY

nickel-cadmium batteries, because they are hermetically sealed in stainless steel cases, Best says. The battery does not generate gas (lead-acid type produces hydrogen) and since the unit is sealed, there is no need to check fluid level or worry about spillage of electrolyte during inverted flight. The electrolyte in the Ni-Ca batteries is a non-corrosive alkaline fluid, whereas lead-acid type used sulfuric acid.

Navy's order of 2,000 of the new batteries from the French firm, Societe Accumulateurs Dixes et de Traction (AVIATION WEEK Mar. 30, p. 16) follows a test of 25 evaluation units delivered about six months ago. An earlier lot of 10 developmental batteries was delivered for analysis 15 months ago.

Initial cost will be $500 a battery, but it is expected that on later orders this cost will be halved as tooling costs are absorbed.

For the present, Ni-Ca batteries will be made in the same dimensions as the old-style units, so they can fit in present battery boxes. But it is believed that the same capacity can be obtained from smaller, lighter units in the future. The life of the nickel-cadmium type may equal that of the aircraft they go in, BuAer officials claim. Experts state that capacity of the new type batteries is 90% greater than that of lead-acid batteries.

First official U. S. contact with the nickel-cadmium battery was during World War II, when it was encountered in the German Focke Wulf 190. Efforts of the Navy and Signal Corps to copy it cost more than one-half million dollars, but the project ended in failure.

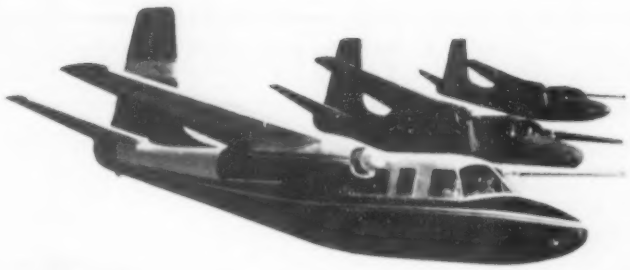
The French firm, SAFT, probably has two-thirds of the world's knowhow on nickel-cadmium. During the war, the long-lasting units were being produced by SAFT, by a German plant in Hanover, and by the Jungers Co. in Sweden, which still produces them for the Swedish Air Force. SAFT bought the German plant after the war and moved it and most of its engineers to France.

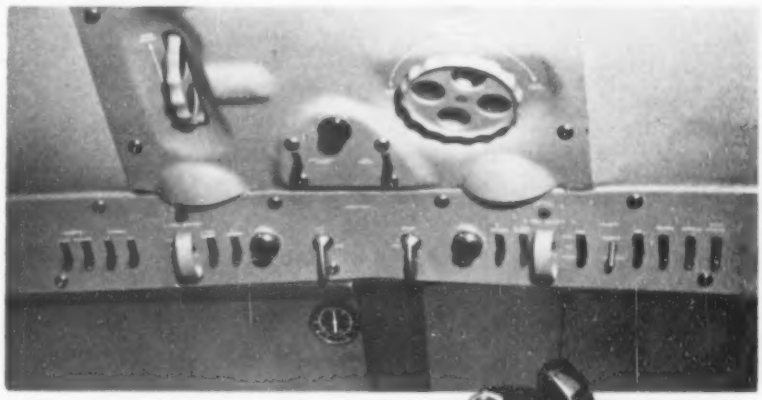
SAFT is now producing Ni-Ca batteries in its plants at Romainville and Bordeaux.

High-Heat Anti-Icing Hose

A new high-temperature anti-icing hose for jet engines is being produced by Acroquip Corp. The hose carries air at temperatures up to 450F to de-ice jet air intakes. It is made of a silicone, rubber-like material, the manufacturer states.

Hose is equipped with the Acroquip's recently developed Little Gem end fitting to give improved sealing of fitting to hose.





Aero Commander

equipped with

KLIXON BREAKERS

for reliable Circuit Protection

The twin-engine "Aero Commander," manufactured by Aero Design & Engineering Co., Oklahoma City, is a deluxe executive light-weight transport that is setting new performance standards. Among the many design features are high wing design, low-lined cabin and unobstructed visibility.

To prevent electrical circuit troubles, Aero Engineers specify and use Klixon switch type Circuit Breakers on every circuit requiring protection. They have found that these switch type circuit breakers save space, simplify pilot procedure on electrical circuit system operation and produce a system of extreme flexibility.

Lightweight, small and compact, Klixon Aircraft Breakers operate surely regardless of altitude, vibration, shock or motion . . . tripping out the circuit when internal troubles jeopardize the electrical system. Yet, harmless momentary transient shorts do not cause nuisance trip-outs.

Provide dependable circuit protection in your planes. Install Klixon Circuit Breakers. Write for bulletins giving data.

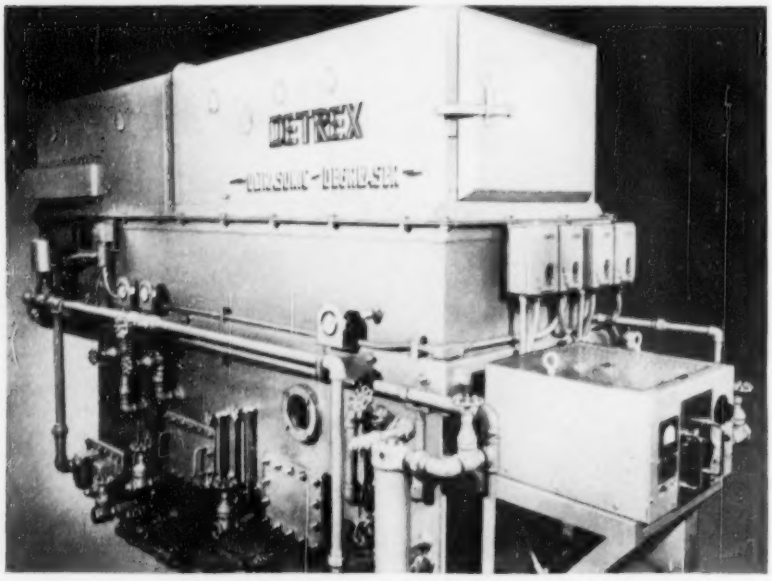
KLIXON

SPENCER THERMOSTAT

Division of Metals & Controls Corporation

2804 FOREST STREET, ATTLEBORO, MASS.

NEW AVIATION PRODUCTS



Ultrasonic Cleaner Shakes Off Dirt

Intricately shaped parts can be cleaned faster and easier with an improved ultrasonic degreaser developed by Detrex Corp. The new unit is said to have greater flexibility than previous machines of this type.

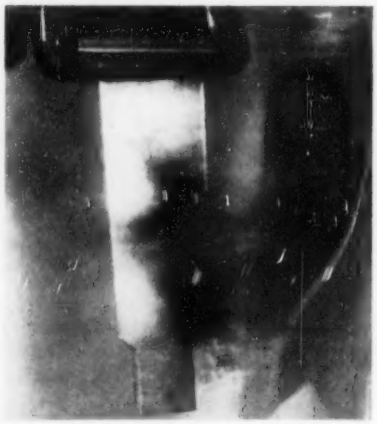
Foreign matter that is difficult to remove by ordinary methods virtually explodes off jet engine blades and other parts given this treatment. In the case of jet blades, iron oxide paste used to detect flaws is removed practically instantaneously.

Key to the improved performance of Detrex's Soniclean process is a new man-made ceramic transducer element. The ceramic elements can be mounted in series and re-arranged as desired for maximum effect. They and the objects to be cleaned are immersed in a solvent such as trichlorethylene.

Ultrasonic cleaners have depended in the past on quartz transducers, but these focus their sound waves at a single point, limiting their effectiveness. The new ceramic transducers send out 430,000-cps. waves along their complete length. At present this is six inches. The process operates at 40 volts.

Instead of pinpoint cleaning, large batches now can be put in the machine and cleaned simultaneously, the company says.

First unit employing the Soniclean process has been purchased by Remington Rand, Inc. This machine is the largest ultrasonic degreaser ever built, Detrex says.



HIGH-FREQUENCY SOUND waves explode iron oxide paste off jet engine blades.

Soniclean facilities can be added to regular degreasers to provide an additional cycle for "maximum refinement in cleaning parts."

Detrex Corp., Detroit 32, Mich.

Nickel Sheet Lets Air Through, Bars Water

A porous nickel sheet for housing aircraft instruments and avionic gear prevents entrance of moisture but permits rapid equalization of air pressures to offset sudden altitude changes, says its maker, Micro Metallic Corp.

The sheet is silicone-treated for water repellency and will not pass water if the differential is less than 3 psi. However, it passes air freely, according to the firm. The moisture seal is said to be sufficient to protect components from rain or accidental immersion in water.

The material can be exposed on outer surfaces of aircraft traveling at transonic speeds with only occasional recoating required against water erosion. Under less stringent conditions, the coating is permanent, the company says.

Micro Metallic Corp., 30 Sea Cliff Ave., Glenn Cove, N. Y.

New Copper Alloy

Development of a copper-base alloy, intended for limited replacement of scarce beryllium-copper alloys and having possible use in aircraft instruments, was revealed at the Western Metal Congress held recently in Los Angeles.

Research and development of the product was carried out by Battelle Memorial Institute in behalf of International Business Machines Corp. The alloy is considered "tailor-made for electrical contact springs . . ." among other uses. It contains about 10% nickel, 1.5% silicon and 4% aluminum.

Cost of the new alloy will be substantially less than that for copper-beryllium alloys, currently selling at $71.50 per pound, Battelle predicts. Supply of the latter is critical because of possible large-scale use of beryllium in the atomic energy program.

Properties listed for the new alloy include good electrical conductivity, corrosion resistance and springiness. The alloy is hard and strong, yet soft enough for forming before hardening.

Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio.

Simulates Desert

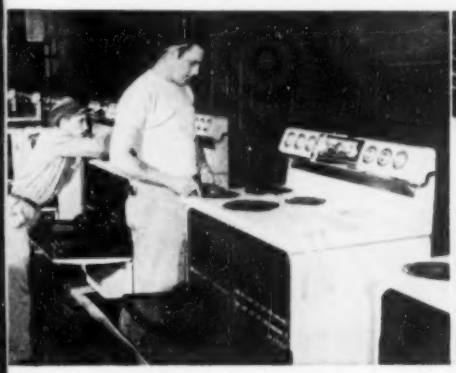
A new sand and dust cycling machine for accurate testing of military components under desert conditions is being produced in several sizes.

The tester is designed to permit precise control of environmental conditions and eliminate constant manual regulation. It also is said to require less floor space than previous types. It was built specifically to meet requirements of MIL-R-5272A and MIL-T-5422A.

The unit is said to embody "entirely new concepts of streamlined airflow" which reduce power needed to move air. Automatic controls enable it to maintain desired conditions for long runs. Humidity indication also is provided for pre-conditioning the equipment. Unit is furnished complete with dust supply and necessary connections.

American Research Corp., Bristol, Conn.

SILASTIC helps Westinghouse score another FIRST...*
"COOKING without LOOKING"



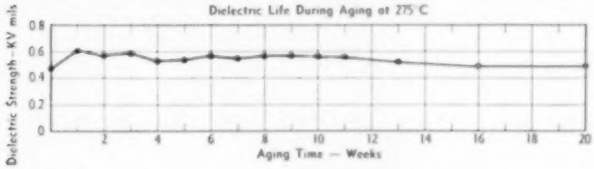
Engineers have been working for years to make a heat control system for electric range surface units that would forever banish pot watching. But it took Westinghouse, using a bit of Silastic, a thermistor, and a few relays and vacuum tubes, to perfect the "Electronic Eye." This heat control system regulates the temperature so accurately that food can be warmed, boiled or fried without danger of burning or scorching—even if all the water is boiled away. The heart of the temperature measuring device, the thermistor, is embedded in Silastic paste for protection and heat transfer. Flexible Silastic insulated cable is used to connect the thermistor to the exterior wiring, and the Electronic Eye itself is isolated in the center of a flexible Silastic diaphragm. The Silastic components have stood up under exposure to boiling water, oil, grease, coffee and syrup, as well as accelerated life testing equivalent to 15 years of actual service.

Performance proves...

SILASTIC works

where other materials fail!

Many of the most able designers, like those Westinghouse men who made automatic cooking a practical reality, save time and money by trying Silastic first when they need rubbery properties at temperatures far above or below the limits of any ordinary rubber. And exceptional stability at both high and low temperatures is combined in Silastic with excellent resistance to outdoor weathering and good resistance to a variety of hot oils and chemicals. Further proof of the inherent stability of Silastic is given in this small graph showing the effect of aging at 275°C (527°F) on the dielectric strength of Silastic.



Dielectric strength measured with ¼ inch electrodes in air on two layers of Silastic R Tape, for example, average 0.475 KV per mil. After 20 weeks of continuous aging at 275°C with both surfaces exposed in an air circulating oven, dielectric strength gradually decreased from a high of 0.601 to 0.485 KV per mil.

That's the kind of performance that makes Silastic, the Dow Corning silicone rubber, unique among all rubbery materials. When you need rubbery properties at temperatures above 150°F or below —40°F, or excellent dielectric properties in a resilient and flexible material ***specify Silastic.***

*T. M. REG. U. S. PAT. OFF.

ATLANTA
CHICAGO
CLEVELAND
DALLAS
LOS ANGELES
NEW YORK
WASHINGTON, D. C.
(Silver Spring, Md.)

first in silicones

DOW CORNING CORPORATION
Midland, Michigan

Canada: Fiberglas Canada Ltd., Toronto • England: Midland Silicones Ltd., London

MAIL COUPON TODAY FOR DATA ON THE PROPERTIES, PERFORMANCE AND APPLICATIONS OF SILASTIC.

DOW CORNING CORPORATION, Dept. D-4A, Midland, Michigan

Please send me:

- ☐ Silastic Facts 10a, properties and applications of Silastic stocks and pastes.
- ☐ List of Silastic Fabricators.
- ☐ "What's A Silicone?", your new 32-page booklet on silicone products and applications.

Name _____ Title _____

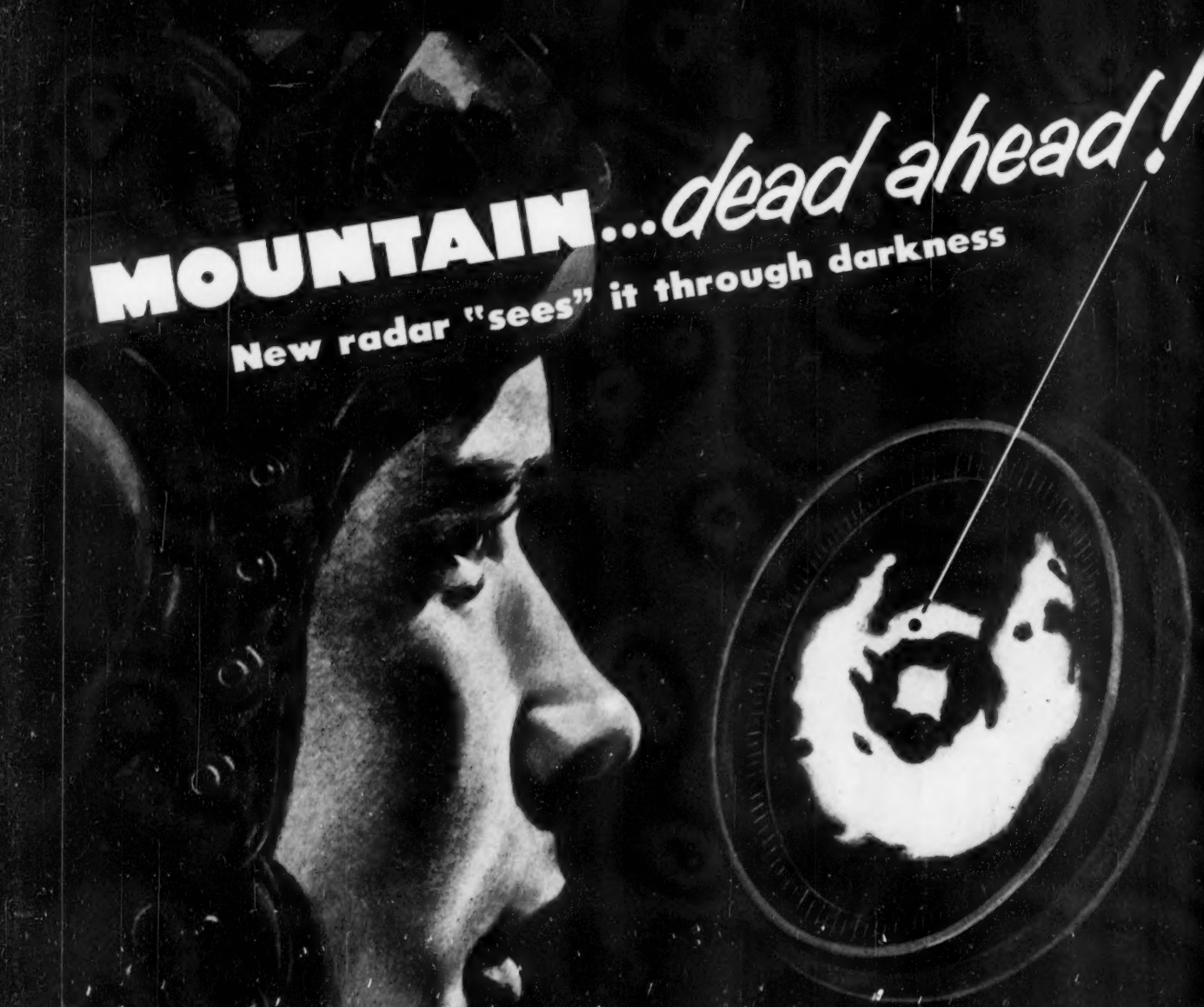
Company _____

Address _____

City _____ Zone _____ State _____

MOUNTAIN...dead ahead!

New radar "sees" it through darkness



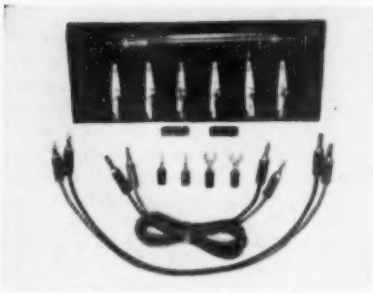
You are looking at the makings of a crash. But it won't happen. Through the darkness a new Aircraft Radar revealed a mountain range directly in the flight path. Now the pilot is climbing to clear it.

Like a powerful telescope, this advanced-type radar equipment enables the pilot to study obstacles "close-up"—in a choice of five different ranges between 5 and 200 miles. Here is a compact lightweight radar that will readily indicate mountains and near-by aircraft. It can locate thunderheads and other cloud formations—permit the pilot to navigate a safe course. It can map terrains, showing the pilot the salient characteristics of the ground he's flying over. It can help the pilot keep his plane on the desired flight path. It can even be used as a visual check against the landing and approach instruments in his plane.

This new Aircraft Radar, made by RCA for the Navy Bureau of Aeronautics, is another technical achievement worked out in close co-operation with the military to insure U.S. supremacy in electronics. Meet the RCA engineers and field technicians in your branch of service.

RCA **RADIO CORPORATION of AMERICA**

ENGINEERING PRODUCTS DEPARTMENT *CAMDEN, N.J.*



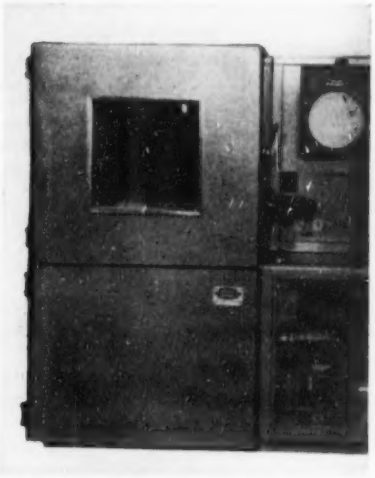
Avionic Test Leads

Air-O-Tronics is marketing a test lead kit complete with a variety of snap-on accessories for universal testing of avionic equipment.

The kit permits speedy interconnection between electrical components and includes both jumper and probe-type leads. These may be fitted with probes, clips or other contacts, permitting connection with pin jacks, banana jacks, terminal posts and other hardware.

An exclusive feature of the set is a polystyrene plug-in probe which can accommodate isolation components in its hollow center. Alligator clips supplied are fitted with vinyl plastic sleeves. The set is designed to meet average laboratory needs.

Air-O-Tronics, Box 31, Lancaster, Calif.



New Cold Chamber

All-weather test chambers that can drop the temperature to —150F and put components through a wide range of altitude and humidity conditions are being custom-built by Conrad Industrial Coolers.

The equipment shown here is installed at Navy's Aircraft Instrument Laboratory in Philadelphia. Refrigeration compressors for the stainless steel chamber are the sealed type, arranged in a new cascade system said to improve performance and flexibility. Test condi-

For More Get-Up and Go...

PIPER L-21 USES

AIRCRAFT SENSENICH PROPELLERS

Fixed Pitch Metal Propellers

Sensenich propellers include: Fixed Pitch Metal, Fixed Pitch Wood, Skyblade CONTROLLABLE and Wood Test Clubs. Write for bulletins and price list.

Piper's Army Model L-21 is the lifeline and eyes of the Army ground forces. Outstanding performance under the most severe conditions is absolutely necessary. That's why Sensenich Fixed Pitch Metal Propellers are...*Right* on the Nose!

SENSENICH CORPORATION • LANCASTER, PENNSYLVANIA

DESIGN
ENGINEERS
AND
DRAFTSMEN

With Experience on Airframes, Equipment Instrumentation, Hydraulics & Structures

ALSO

TOOL DESIGNERS and PLANNERS
LOFTSMEN
DESIGN CHECKERS
With Aircraft Experience

• This is a long-term program featuring the design and development of advanced JET AIRCRAFT, offering recognition of ability and opportunity to advance. Top salaries. Air-conditioned offices. Ideal suburban living conditions.

KAISER METAL PRODUCTS, Inc.
Radcliffe St. Bristol, Pa.

CPI
HIGH TEMPERATURE SWITCH

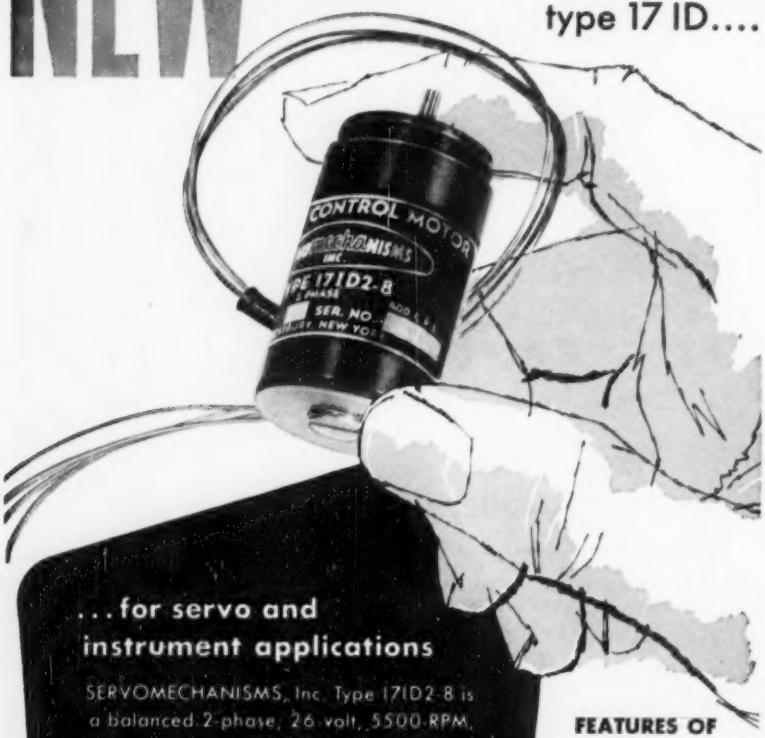
with
INSULATED MOUNT FOR TWO WIRE INSTALLATION

for
DE-ICING SYSTEMS
HEAT EXCHANGERS
HEATERS
and
STRUCTURE OVERHEAT INDICATION

Features low thermal mass giving fast thermal response and has the ability to withstand extreme under or overshoots of temperature. Performance proven by thousands of hours flight time on America's outstanding military aircraft. A precision thermal control manufactured to the most exacting standards of instrumentation. AMC approved. Write for complete data; inquiries on special problems invited.

CONTROL PRODUCTS - INC
306 SUSSEX STREET • HARRISON, N. J.
DESIGNERS AND MANUFACTURERS OF THERMAL DEVICES

NEW miniature damped control motor type 17 ID....



...for servo and instrument applications

SERVOMECHANISMS, Inc. Type 17ID2-8 is a balanced 2-phase, 26-volt, 5500-RPM, 400-cycle damped induction motor employing a drag cup and an axially adjustable magnet to achieve velocity damping. This design provides for variable and smooth linear velocity damping and lower operating temperature. The desired degree of viscous damping is achieved by operating setscrew adjustment.

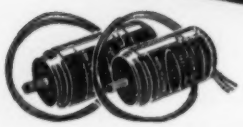
* * *

The non-damped induction control motor 17I2-8 of 8,000 RPM is also available.

FEATURES OF DAMPED CONSTRUCTION DESIGN INCLUDE

- Cogless Damping
- Zero Residual Noise Signal
- Constant Damping
- Lower Inertia
- Lower Cost

Write to Dept.-CLO-3 for specific information on motors.



OTHER INSTRUMENT MOTORS

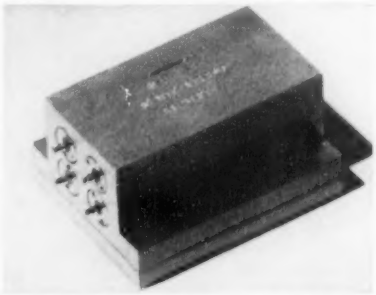
..... Hysteresis Synchronous design, Type 17H1-8 for 26 volts and Type 19H for 115 volts in speeds of 8,000, 12,000, and 24,000 RPM are available for various applications. Special windings and external shaft configuration can be provided on request.

SERVOmechaNISMS INC.
WESTBURY, L. I., N. Y.
EL SEGUNDO, CAL. NEW CASSEL, N.Y.

tions are reached more quickly. Refrigerants for the cooler are Freon 13 and 22. Temperature can be set at any point from −150 to 200F. Heat is supplied by stainless steel-sheathed strip heaters.

Altitude conditions are provided in a chamber within the main chamber, which in effect insulates it from any sudden ambient changes. Capacity of the main cabinet in the Navy unit is 8 cu. ft., but sizes range up to 36 cu. ft. The refrigeration system is housed in the screened compartment; cooling coils, heaters, fan and vacuum pump are located immediately below the test cabinet, accessible through a hinged access door.

Conrad Industrial Coolers, 52 W. Fourth St., Holland, Mich.



Lab Measuring Units

A line of measuring instruments for ground and flight investigations has been announced by Scientific Enterprises.

It includes inductive and floating strain wire type transducers, linear accelerometers, angular accelerometers, pressure and differential pressure transducers and strain gages.

Among advantages cited by the company for the instruments:

- **Transducer response** is only about intended axis of sensitivity.
- **Coriolis acceleration** can be measured with no response to centripetal and centrifugal forces.
- **Erroneous responses** introduced by components of angular rotation are eliminated.
- **Inductive-type instrument** gives more accurate readings and meets certain requirements not possible with strain wire type instruments.

The instruments generally have an accuracy of 1% of scale or better and operate through temperatures from −65 to 200 F. Resolution is .06% of full scale or better. Ranges are .25G to 5000G for linear accelerometers; 0.1 rad./sec.^{2} to 3,000 rad./sec.^{2} for angular accelerometers; 0 to .050 in. H_2O and O to .5 psi. and upwards for pressure and differential pressure transducers; and .003 in./in. for strain gages.

Scientific Enterprises, 832 N. La Brea Ave., Hollywood 38, Calif.

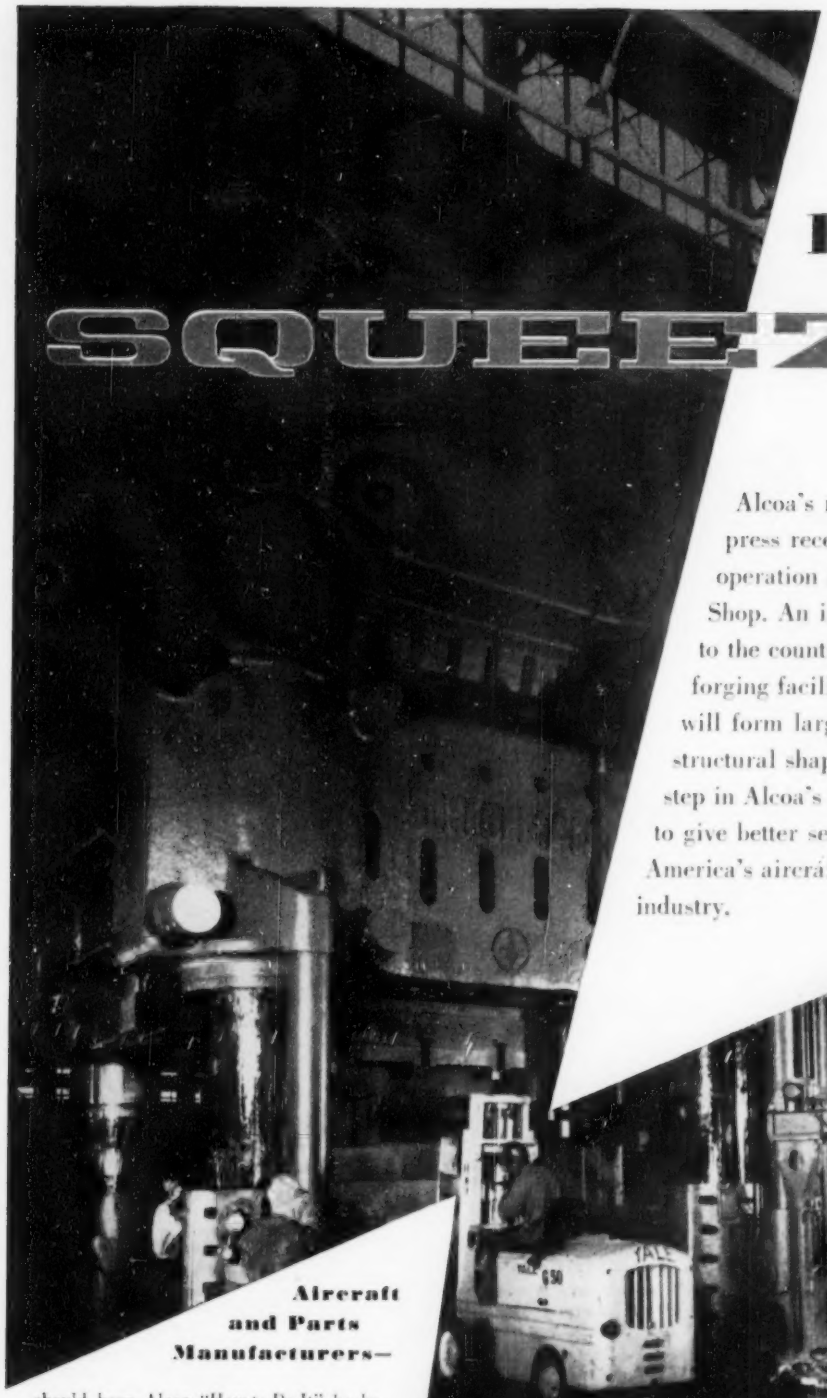
Would a Welded Component solve your design problem?

In the development of jet aircraft engines, American Welding products have played a vital part. Today every major U. S. jet engine manufacturer is a user of American Welding rings, bands, or components.

We do not know what jets, guided missiles or rockets you are working on, but we feel sure that our 34 years of welding experience can be helpful in getting your designs "off the blueprint — into the blue".

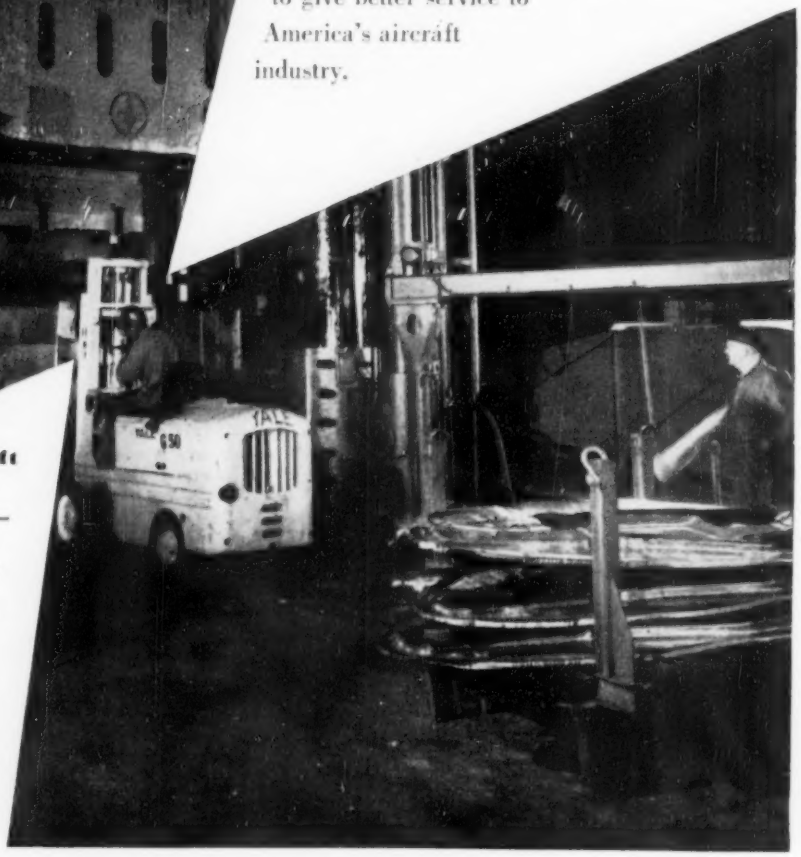
In addition, we can provide designing, engineering, metallurgical and machining facilities. If your requirements involve either fusion or resistance welding of ferrous or non-ferrous metals, we will be glad to have our Product Development Department look into your problem.

THE AMERICAN WELDING & MANUFACTURING CO.
420 DIETZ ROAD • WARREN, OHIO



The 15,000-Ton SQUEEZE

Alcoa's new 15,000-ton forging press recently went into operation at the Cleveland Forge Shop. An important addition to the country's largest aluminum forging facilities, this new press will form larger and more intricate structural shapes. It is the first step in Alcoa's "big press" program to give better service to America's aircraft industry.



Aircraft and Parts Manufacturers—

should have Alcoa "How-to-Do-It" books and sound movies to train their employees. Ask for any of the following books: *Forming Alcoa Aluminum, Designing for Alcoa Die Castings, Designing for Alcoa Forgings, Alcoa Aluminum and Its Alloys.* Sound films are available on most fabrication processes.

ALUMINUM COMPANY OF AMERICA
1800-D Gulf Building
Pittsburgh 19, Pennsylvania

ALSO ON THE MARKET

French milling machines built to American specifications are available in three models, including combination vertical and horizontal type. Rigidly constructed for heavy duty service, they are equipped with automatic cycle controls and powered by 25-hp. motors.—Morey Machinery Co., Inc., 410 Broome St., New York 13.

Improved vitrified bond for grinding wheels for precision work is said to enable wheels to do more pieces per dressing and to cut cooler, freer and faster, leaving no jagged edges, and cover a wider range of jobs.—Norton Co., Worcester 6, Mass.

Template making is eliminated with adjustable profile template which can be made to fit almost any profile to close tolerances; uses series of hard brass strips, each only .007 thick.—Toolcraft Mfg. Co., 6619 S. Dorchester Ave., Chicago 37, Ill.

Stud extracting and setting is done faster and with less damage to studbolts with new keyless Stud Puller-Chuck tool adaptable to drill presses, lathes, portable reverberating machines and similar equipment; does not score or mark parts and virtually eliminates breakage, according to distributor.—Faver, Inc., 770 S. Second St., Salt Lake City, Utah.

Tiny multiple tape recorder measures shock and impacts in all directions on parts in tests on shipping damage, when frequency as well as intensity is desired; tape moves forward with each shock.—Impact-O-Graph Corp., 1900 Euclid Ave., Cleveland 15, Ohio.

Midget air cylinders with one-inch piston stroke can be used for ejection and injection of work and clamping parts in small jigs and fixtures. They deliver 75-lb. thrust when hooked to 100-psi. service lines.—Air-Mite Co., 4417 W. Carroll St., Chicago, Ill.

Spray White cleaner has been developed as a faster, safer means of removing grease, wax, gums, dirt, carbon and other foreign matter from virtually any type surface without danger to personnel or damage to product.—Kelite Products, Inc., 1250 N. Main St., Los Angeles 12, Calif.

Air gage (Air-O-Limit Model G Comparator) with recently developed amplifying unit permits 10,000 to 1 magnification and has improved indicator.—Pratt & Whitney, Div. of Niles-Bement-Pond Co., West Hartford 1, Conn.

triple threat

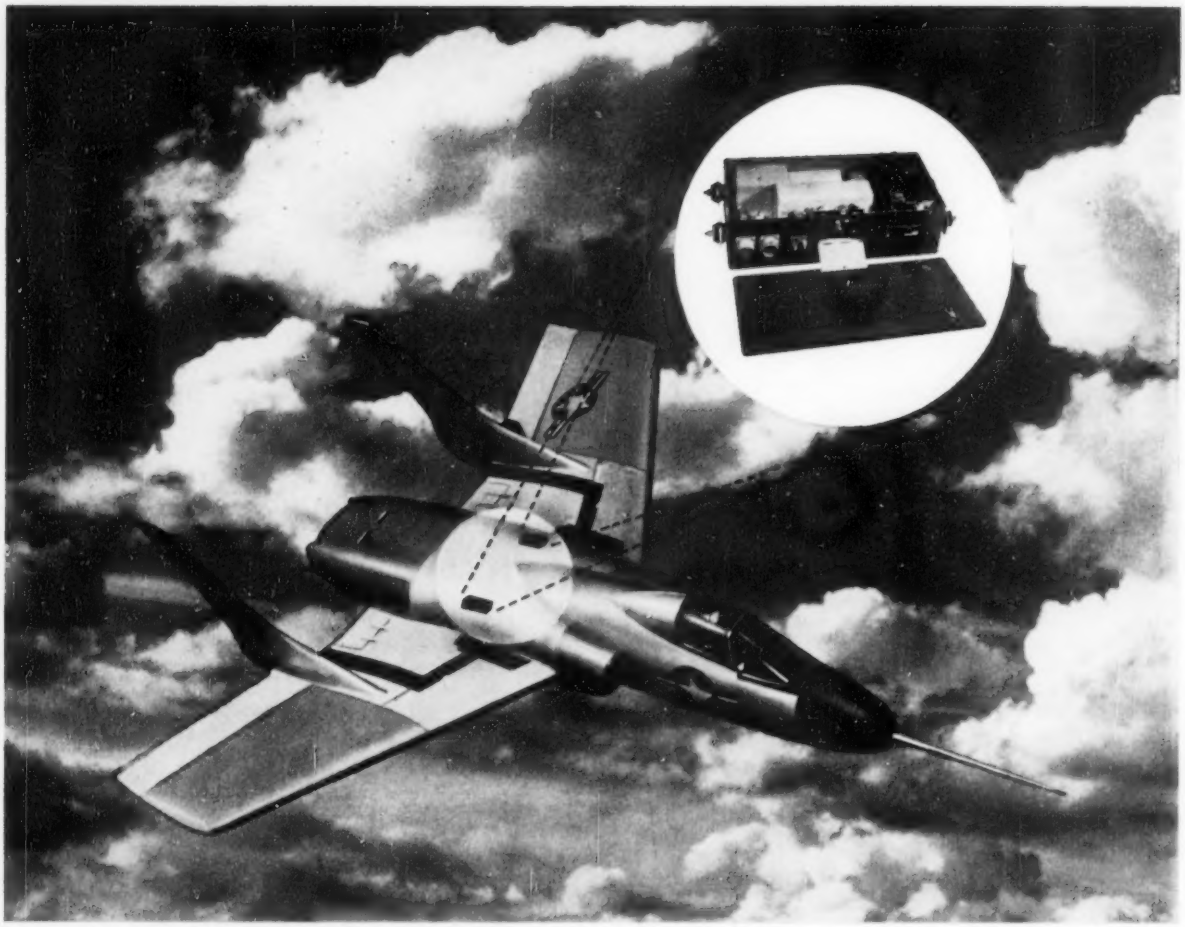
Changing temperatures, vibrations, and accelerations affect the operation of all instruments. In spite of these variables, our products produce the right answers because they are properly designed.

- AIRCRAFT INSTRUMENTS AND CONTROLS
- OPTICAL PARTS AND DEVICES
- MINIATURE AC MOTORS
- RADIO COMMUNICATIONS AND NAVIGATION EQUIPMENT

Current production is largely destined for our defense forces; but our research facilities, our skills and talents, are available to scientists seeking solutions to instrumentation and control problems.

kollsman INSTRUMENT CORP.

ELMHURST, NEW YORK • GLENDALE, CALIFORNIA • SUBSIDIARY OF Standard COIL PRODUCTS CO., INC.



TURBOJET ENGINE

TEMPERATURE CONTROL AMPLIFIERS

You want and must have completely reliable temperature control amplifiers — amplifiers designed and constructed to meet specific basic requirements of your turbojet engines, such as:

1. Efficient operation in ambient temperatures from minus 65°F to plus 200°F.
2. Vibration endurance covering a range from 5 to 150 cycles per second.
3. Operation in altitudes up to 60,000 feet through the use of hermetically-sealed components.
4. Center-of-gravity shock mounting to permit installation right on the turbojet engine.

Manning, Maxwell & Moore turbojet engine temperature control amplifiers satisfy all four requirements. They incorporate a highly successful design principle thoroughly proved during years of concentrated research, development and tests devoted exclusively to automatic control systems for jet engines.

We believe our ability to apply our unique design technique to specific and unusual turbojet engine temperature control problems can be of real value to you. Our engineering counsel and extensive manufacturing and test facilities are at your service. We welcome your inquiry.

MANNING, MAXWELL & MOORE, INC.

AIRCRAFT PRODUCTS DIVISION • STRATFORD, CONN.

OUR AIRCRAFT PRODUCTS INCLUDE: TURBOJET ENGINE TEMPERATURE CONTROL AMPLIFIERS • ELECTRONIC AMPLIFIERS PRESSURE SWITCHES FOR ROCKETS, JET ENGINE AND AIRFRAME APPLICATIONS • PRESSURE GAUGES THERMOCOUPLES • HYDRAULIC VALVES • JET ENGINE AFTERBURNER CONTROL SYSTEMS.

Fares Hearings Up to New CAB Member

- **Denny has decisive vote on motion to dismiss.**
- **The outlook: a toned-down earnings "survey."**

By Lee Moore

Outlook last week was that Civil Aeronautics Board would go ahead with its investigation of domestic airline fares and earnings.

The Board was split two-to-two on an airlines' petition to dismiss the case until the new fifth member, Harmar Denny, proposed a compromise decision in favor of proceeding with a toned-down version of the investigation. He wants it to be more of a survey than the previously scheduled battle royal between the airlines and the CAB rate-making staff.

The case at issue is the General Fares Investigation. Formal hearings tentatively are slated to start next week. All the trunklines recently petitioned for dismissal of the case. Immediately after taking office, Denny was called on to cast the deciding vote as the battle lines were drawn up as follows:

• **Oswald Ryan and Chan Gurney,** backed by all the trunklines, opposed continuance of the investigation.

• **Joseph Adams and Josh Lee,** backed by the entire rate-making staff, wanted to continue it.

• **New member Denny** indicated he would break the tie by voting for an investigation. He said he was surprised that the Board never had investigated the overall rate setup. But he was also surprised that it was scheduled to take the form of an "argument" leading to a definite Board decision—fares up, down or continuing the same. Denny said he wants the investigation to be kept amicable.

Chairman Ryan and the other members early last week were busy drafting a compromise version of the case, more on the order of a fact-finding investigation and not necessarily requiring an irrevocable Board conclusion.

The domestic airlines, which have repeatedly petitioned CAB to dismiss the investigation, actually started the probe themselves a year ago. They had asked much higher fares, but now they fear that Board investigation of their earnings may lead to lower fares.

▶ **The Issues**—Main aims of the investigation are to find out how high fares should be set to yield a fair return to investors at lowest cost to the public.

Here are main issues that question involves:

How high should CAB permit non-subsidized airlines' return on investment to rise before cutting fares?

Old CAB policy was to grant enough subsidy to yield an 8% return on investment. Since the subsidy mail rate was generally geared to plane-mile volume, airlines often favored lower fares. CAB, with absolute control over the airlines' future, felt less compunction about experimenting with fares than now, when most domestic airlines are completely free from reliance on subsidy.

New 16% return earned by non-subsidized airlines for more than two years has raised a totally new rate-making problem. Returns now depend on the fare level.

• **Setting fares** "in the public interest" is complicated by increased importance of correctly forecasting how much revenue and earnings fares will produce. In a non-regulated competitive industry, salesmen can juggle prices to equate supply and demand. But the semi-competitive, CAB-regulated airlines can not do that. So pricing the product in the CAB manner—uniform, government-approved unit fares regardless of local conditions—involves the task of price forecasting without experimenting.

• **Fare taper** is a secondary issue in this investigation. Some airlines and Board officials propose that unit fares taper more in accordance with costs. Flying a passenger 200 mi. may cost 6 cents a mile, while flying him 2,000 mi. may cost only 3 cents a mile. Yet the first-class fares are virtually all 6 cents a mile today. However, surface transport competition prohibits raising shorthaul fares substantially, and longhaul air-coach fares are down to 4 cents a mile. So many observers calculate that the general taper of fares may not be far from correct.

• **Time lag** is the final issue in the new rate-making investigation. Business forecasts of the airlines changed twice since the investigation started a year ago. The Board proved more nearly correct in forecasting. It predicted moderate airline prosperity through the first half of last year and a boom the second half.

However, it will be another six months to a year before CAB can conclude the investigation. Short-term outlook this spring is for continued stability at 1951-52 rates. But a decision based on recent data might prove wrong if the outlook changes late this year. That

Domestic Trunkline Earnings Ratios

(Excludes trunks with foreign subsidy routes)

	Net return on investment*		Operating profit margin**	
	1952	1951	1952	1951
American (s)	15	14	14	18
Eastern (s)	18	19	13	21
United (s)	12	15	16	15
Capital	15	22	5	10
Delta	29	21	14	18
National (s)	24	28	11	18
Western	13	21	16	18
Continental	16	15	7	9
Northeast	(–1)	5	(–4)	3
Average* **	16%	18%	10%	14%
Weighted Average** **	16%	16%	13	17

* Stockholders' net return after taxes, etc.
** Sales margin on operations—before non-operating income and expense and before income taxes.
*** Average is sum of individual airline ratios, divided by number of them. This yields a typical ratio for the nine trunks shown.
**** Weighted average of net return on investment is the nine airlines' total net profit divided by their total net worth; for profit margin, it is their total net operating income divided by their total revenue. American, Eastern and United completely dominate this type average.
(s) Stub-end territorial or international routes consolidated in system.

Sources: Form 41 reports of carriers to CAB; ratios computed by Aviation Week *and CAB Rates Division.*

is the Board's dilemma. Airlines say hands-off. CAB answers that it has a public responsibility to regulate fares of a protected utility.

Allegheny Wins 3-Year Certificate Renewal

Allegheny Airlines route certificate was renewed last week through the end of 1956 by Civil Aeronautics Board. The Board also approved:

• **Route extension** of Allegheny (formerly All-American Airways) to new cities between Cleveland-New York and Cleveland-Philadelphia.

• **Mohawk Airlines** authorization to fly from Elmira-Corning, N. Y., via its route No. 94 to Bradford, Pa.

• **Colonial Airlines** extension from Allentown, Pa., to Philadelphia with further temporary authorization to serve Lancaster, Pa., on this route.

• **Trans World Airlines'** suspension from Lancaster, Pa., and Wilmington, Del.

• **American Airlines'** suspension from Huntington, W. Va., and (when Allegheny starts serving it) Erie, Pa.

CAB member Josh Lee agreed on renewal of Allegheny's certificate but urged that CAB grant the carrier's application for a new route from Washington to Cincinnati via Elkins, Clarksburg and Parkersburg and let American drop service to those intermediate points.

CAB has estimated Allegheny's subsidy at about $1.5 million annually.

Southern Airways Wins Route Renewal

Southern Airways won renewal of its local service route certificate by Civil Aeronautics Board until Dec. 31, 1956.

Under the new certificate, effective June 13, Southern will serve 30 cities in Louisiana, Mississippi, Tennessee, Alabama, Georgia, South Carolina, North Carolina and Florida. CAB recently estimated Southern's annual subsidy requirement for this service at about $1.5 million.

Route changes which were approved by the Board:

• Route extension to serve Monroe, La., and Gulfport/Biloxi, Miss.

• Route reduction to drop the segment from Columbus, Ga., to Charleston, S. C., and stops at Hattiesburg, Miss., and Rock Hill, S. C.

• Trunklines keep services that Southern recommended be transferred to it. CAB did not approve the proposed suspension by Eastern at Spartanburg, S. C., Albany, Ga., and Dothan, Ala.; by National to Valdosta, Ga.; or by Chicago & Southern to Greenwood, Miss.

HARMAR D. DENNY, JR. (right) uses Boy Scout sign as he is sworn in as a CAB member by chairman Oswald Ryan. Denny is on the Boy Scouts National Executive Board.

Denny Holds Balance in CAB

Balance of power on the five-man Civil Aeronautics Board has fallen to the new Republican member, Harmar Denny Denny, Jr.

Continuance of CAB's General Fares Investigation—opposed by all airlines—now hangs upon his decision.

Other important cases on which his vote may be decisive this year include:

• Colonial merger with Eastern or National.

• Slick-Flying Tiger merger.

• Trans-Atlantic cargo case.

• Decision on new route extension applications to be consolidated in the transcontinental Denver and Oklahoma service cases.

Denny's term expires Dec. 31, but Washington observers predict he will be re-appointed to a full six-year term.

▶ **Airline Policy**—In his short appearance for Senate confirmation, Denny told the senators: "I don't want to attach myself to the small or large airlines, to the skeds or nonskeds." He added that he "would be very much ashamed of myself if I were classified as an advocate of one or the other."

Asked how he felt about subsidy for local service airlines he said: "I don't think they could exist for public convenience unless they were subsidized, many of them."

Denny told AVIATION WEEK he is not yet prepared to make any further statements on CAB policy, as he has only started the job.

▶ **Picks Assistant**—Denny last week selected as his executive assistant R. Vernon Radcliffe, a CAB examiner since 1945. Radcliffe is both a graduate engineer and lawyer (B.S. New York University, LLB. Georgetown University).

Prior to becoming a CAB examiner, he was a test engineer for National Advisory Committee for Aeronautics at the Langley Field aeronautical laboratories and later assistant to the executive officer in NACA's Washington headquarters.

▶ **Aviation Experience**—Denny's aviation background:

• **Pilot.** Too old to enlist directly as a flyer in World War I, Denny volunteered as a private and won a commission in ground training. He became officer in charge of ground training at Gerstner Field, Lake Charles, La., and thereby managed to log about 100 hr. pilot time by war's end—substantial experience for those days and planes.

• **Route witness.** Denny represented the aeronautics committee of the Pittsburgh Chamber of Commerce on several early route cases. The most notable, he says, was the bitterly controversial Trans World Airlines application to serve San Francisco. He testified in favor of it, because Pittsburgh naturally wanted direct service. Denny also was on the airport advisory committee of Allegheny County for about 10 years and long has been a member of the Aero Club of Pittsburgh.

• **Pilot training inspector.** During World War II, Denny was assistant air inspector for the Eastern Flight Training Command. As part of an Air Force team inspecting training bases, he says he probably talked to as many pilots as any man in the war. His job was check-

ing up on living conditions and pilot morale.

• **Commerce committeeman.** Denny says he learned a lot about CAB and the airlines when he served on the House Interstate and Foreign Commerce Committee 1950-52.

▶ **Politics**—The new CAB member's first brush with politics was his appointment as Director of Public Safety by Pittsburgh's last Republican mayor in 1933. He served about 11 months, a term cut short by the election of a Democratic mayor.

In 1941, Denny ran for mayor against Cornelius Scully and lost by 2,800 out of 225,000 votes cast. He tried unsuccessfully four years later for the Republican nomination for mayor. In 1950, he was elected to Congress from Pennsylvania's 29th District in Pittsburgh, succeeding another Republican.

But he was then redistricted into a Democratic stronghold and lost in last year's election.

On the National Executive Board of the Boy Scouts of America, Denny had contact with President Eisenhower, who also served on the board while president of Columbia University. Denny says Mr. Eisenhower impressed him greatly as an all-around, warm and imaginative person. He was an "Ike man" from there on in, Denny says.

▶ **Pittsburgh Prominence**—The Denny family has been prominent in Pittsburgh since before 1796, when Ebenezer Denny was Allegheny County commissioner and later Pittsburgh's first mayor. His great-grandfather, Harmar Denny, was a member of Congress during the years 1829-37.

Denny at 67 is dignified, tall, fit-figured, mild-mannered, conservatively dressed, bald, white-mustached, and is called "The Colonel" (Air Force Lt. Col., Ret.). He is an able and enthusiastic golfer (handicap 10).

He attended St. Paul's Preparatory School and Yale University, received his law degree at University of Pittsburgh in 1911, became attorney-at-law, investment counsellor, and chairman of the advisory committee of Denny properties. Although his grandfather and father were wealthy, Denny is not. The family properties are now divided into 29 parts and have suffered heavy tax liens.

▶ **Boy Scouts**—Denny is proudest of his "39 years in Scouting" and 15 years on the national executive board.

His other activities have included American Legion, Carnegie Hero Fund Commission, Board of Western Pennsylvania Safety Council, Society of the Cincinnati, Sons of the American Revolution, and board of trustees of the First Presbyterian Church of Pittsburgh.

Denny is married, has a son, two daughters and six grandchildren.

Lack of Heliports Stymies N. Y. Airways

Lack of suitably located heliports in the heart of New York City is holding up New York Airways plans to expand its services directly into this area, Robert L. Cummings, Jr., NYA president told stockholders in the first annual report issued by the certificated carrier.

He noted that although Los Angeles and Chicago are utilizing roofs of post offices in their midtown areas, no such facilities are available in New York.

Inauguration of helicopter passenger service this year on a limited basis between La Guardia, Newark and N. Y. International (Idlewild) Airports is anticipated by New York Airways officials, Cummings said.

The carrier showed operating revenues totaling $56,507 compared with expenses of $126,342 for the carrier's eleven-week operating year ending Dec. 31st. This $69,835 operating loss was increased to a $81,627 net loss by non-operations, occurring principally before the carrier began flying.

▶ **New Copters**—Much of this deficit is expected to be made up when Civil Aeronautics Board provides retroactive payments in adjusting NYA's temporary mail rate, which at present is $2.50 per ton mile for the first 14,300 mi.

The carrier expects to put into operation this year additional Sikorsky S-55 helicopters so that by the end of 1953 its services will extend from Peekskill, N. Y. on the north to Trenton and Asbury Park, N. J. on the south—and from Dover, N. J. on the west as far east as Freeport, L. I., and Bridgeport, Conn. These flights will utilize from five to seven S-55s.

At the end of March, 1953 New York Airways S-55s had put 1,345 hr. aloft and flown 79,613 mi. In that time they carried 1,029,323 lb. of mail and flown 13,129 lb. of cargo. The latter operation was started in January.

CAB Calendar

Examiner hearings, economic:

- Large irregular carrier policy investigation 5132, resumes in Miami early May, time and place unannounced as yet. Examiners Richard Walsh and Ralph Wiser.
- Trans-Atlantic cargo case 3041, in progress. Herbert Bryan.
- Braniff Airways mail rate 5142, in progress. Barron Fredericks.
- General passenger fare investigation 5509, date delayed from May 1. Merrit Ruhlen.
- Tariff liability investigation 4659, May 6. James Keith.
- South Pacific Air Lines' Hawaii-Society Islands route case 5849, May 12. Curtis Henderson.
- Trans-Pacific route renewal case 5031, June 22. Thomas Wrenn.
- West Coast-Hawaii route case 5589, July 6. Thomas Wrenn.
- U. S.-Alaska route case 5756, July 27. Francis Brown.
- Alaska Airlines mail rate 2021, Aug. 3. Edward Stodola.

Oral arguments before Board, economic:

- Portland-Seattle service case 2901, Apr. 28.
- Continental Air Lines Wichita Falls-Dallas service 3094, Apr. 30.
- Pan American World Airways free transport N. Y.-Miami 5477, May 5.
- Wiggins Airways route renewal 5055, May 12.

India's Airlines Face Government Operation

India's parliament at New Delhi is expected to pass air corporations bill this month nationalizing the nine Indian airlines into two government-owned corporations.

The bill would merge the carriers into:

- Indian Airlines, domestic operator serving all intra-India routes and nearby foreign points in Pakistan, Ceylon, Iran, Afghanistan and Burma.
- Air India International, serving long foreign routes.

Since Mar. 1, 1949, the Indian government has paid about $2.8 million in subsidies to keep the airlines in operation.

Under the provisions of the nationalization bill, the government would buy 12 new aircraft to operate on trunk routes within India and to supplement the present international fleet of Constellations. Dakotas and Vikings now in use would be operated on feeder routes.

Transfer of aircraft and equipment from private to government ownership would become effective June 1. Cost to the government is estimated at $10 million, of which 10% is to be paid in cash to private line owners.

Two new agencies would be set up by the government to aid in administering the nationalized program: An air transport council and a labor relations committee.

J. R. D. Tata, chairman of Air-India International, Ltd., is expected to be named chairman of the new international airline. K. C. Mahindra, former head of the Indian Purchasing Mission in Washington, has been mentioned as possible chairman of the domestic carrier.

Correction

Trans World Airlines president Ralph Damon's 1952 salary was $85,000 and bonus and other compensation $26,306, or a total of $111,306, according to a company report to CAB. AVIATION WEEK erroneously reported Apr. 13 that Damon received bonus and other compensation of $72,407 for a total, together with salary, of $157,407.

Aircoach Future

- **CAB member proposes tripling tourist service.**
- **Low-fare flights will give airlines stability, he says.**

Civil Aeronautics Board member Joseph Adams proposes expansion of aircoach until it totals 80% of all air transport.

To illustrate aircoach market potential, Adams cites rail-travel statistics showing that 89% of intercity rail passengers go by coach, while 80% of airline passengers still fly first-class. But he says airlines at last are moving rapidly toward aircoach domination.

Adams' statements—included in a speech this month to the Oakland Chamber of Commerce—were checked by other CAB officials to make sure they generally coincided with Board policy.

"Air transportation must leave the luxury class and become a necessity," Adams says. Airline investors would gain by it, he adds.

▶ **Healthy Growth**—Air transport is "one of the healthiest growth industries of our time," Adams says, adding that he regrets having to sell 500 shares of airline stock when he joined CAB.

Aircoach volume grew 80% in 1952 alone, the Board member points out. Trunk airlines' net income after taxes has averaged 8% return on investment the last 14 years, was 14% in 1951 and 13% in 1952 (before interest charges).

Adams says the Board asked airlines in December 1951 to expand aircoach and increase seating of planes "so that their net revenue per plane-mile would not suffer at all as a result of the lower revenue for each passenger carried.

"Thus, it just simply is not true that the recent introduction of low coach fares could possibly, even in the short run, adversely affect airline revenues," Adams says.

He recalls his statement on the transcontinental coach case a year ago that, with removal of war stimulus to luxury travel some day, "the destiny of the certificated airlines will be increasingly dependent on the low-fare aircoach traveler."

▶ **Slow Start**—Adams notes that airlines were slow to catch on to aircoach but now consider it their greatest growth potential.

"Begun in 1946 by our non-scheduled or irregular carriers, this new type of service was immediately and enthusiastically accepted by the travelling public," Adams says. "In late 1948, a low-fare night coach service was operated by one of our trunkline scheduled operators (Capital), and others of the trunklines began both day and night coach services in 1949.

"We have only scratched the surface . . . ," he concludes.

▶ **Dividend Habit**—"I feel that the Board is committed under the Civil Aeronautics Act, in developing a sound air transportation system, to also be concerned with the welfare of the investor," Adams says.

He notes the airlines' dividend record is improving and "more and more carriers for the first time have gotten in

SUPER CONNIE MODEL is admired by Northwest Airlines president Harold R. Harris (center), Lockheed president Robert E. Gross (right) and Lockheed assistant director of commercial sales P. K. Yost, Jr., on occasion of NWA contracting for six of the planes.

NWA Buys Super Connie Fleet

Northwest Airlines president Gen. Harold R. Harris last week signed a contract with Lockheed Aircraft Corp. for six Lockheed 1049E Wright Turbo-Compound-powered Super Constellations at a cost of $15 million, including spares. The carrier also has an option to buy six more, according to Harris.

First Super Connie is scheduled to be delivered to NWA in November 1954 and the sixth plane in February 1955.

The NWA planes will add 1 million daily seat miles to the carrier's seating capacity—an increase of approximately 33%. Thus the domestic and international operator will be able to expand its U. S. and trans-Pacific services considerably, in addition to cutting flight times on present schedules.

▶ **Flight Time Cut**—It is estimated the Super Connies will cut New York-Seattle flying time two hours and enable 28-hour schedules from New York to the Orient. They also will be used on the 13,000-mi. route extensions Northwest plans into Southeast Asia to Calcutta, and now pending before CAB for approval (AVIATION WEEK Jan. 26, 1953, p. 81). The Super Connies will seat 66 on the trans-Pacific flights. Seating can be arranged to handle 47-99.

The carrier now operates 17,000 mi. of routes from New York and Washington, D. C. in the East to Portland, Ore., and Seattle-Tacoma in the Pacific Northwest and to Hawaii to the Orient by way of the Great Circle route.

According to a high Northwest official, the company also looked at the new Douglas DC-7 prior to ordering the 1049Es. Choice was finally decided upon because of the Super Connie's more favorable long-range characteristics, the official stated.

To finance this initial addition to its fleet, NWA has arranged a $21.8-million credit with 14 banks. Payments will run to Dec. 31, 1959. Part of this loan will be used to retire a current obligation of $6.8 million.

the dividend habit in the recent few years."

"Continued expansion of coach services can, if actively and thoroughly exploited, result in real stability for this industry by broadening and making less volatile its revenue base," the Board member forecasts.

▶**CAB Policy**—Adams points out the Board's policy goes beyond financial profit motive of the individual airline investor. In addition to national defense and Post Office interest, he outlines points of "public interest" in which the Civil Aeronautics Act requires CAB to work:

- **Cut subsidies** as rapidly as possible to ease tax burden.
- **Improve investment** by developing a sound air transport system to the end that "our investing public have a high regard for the soundness of the air transport industry as an investment."
- **Expand service** to as many persons as possible in all areas of the U.S.
- **Bring fares** to those persons at rates "as low as is economically feasible."

National Executives Boost Stock Holdings

National Airlines' report of salaries, bonuses and stockholdings for 1952 shows that most top executives were paid about $2,000 less bonus than in 1951, but they bought an average of about 1,000 shares of company stock, picking up their options at 85% of market price.

President G. T. Baker took an $8,000 cut in bonus and did not change his holdings of 17% of total National stock outstanding.

Here are details of the National report to Civil Aeronautics Board of 1952 compensation and stockholdings, with comparative 1951 figures shown in parentheses where a change occurred:

G. T. Baker, president and director, salary $30,000, bonuses and indirect compensation $43,504 ($51,401), common stock shares 168,464; John L. Morris, vice president, salary $12,000, bonuses and indirect compensation $17,402 ($20,560), shares 1,010 (10); Walter Sternberg, vice president-sales, salary $20,000, bonuses and indirect compensation $29,003 ($30,634), shares 1,131 (100); E. J. Kershaw, vice president-operations, salary $16,000, bonuses and indirect compensation $23,202 ($27,414), shares 1,950 (600); J. M. Rosenthal, vice president-industrial relations, salary $12,000, bonuses and indirect compensation $17,402 ($20,560), shares 1,500 (500); R. E. Wieland, regional vice president, salary $10,875 ($9,000), bonuses and indirect compensation $13,595 ($15,420), shares 1,408 (300); J. C. Brawner, treasurer and director, salary $12,000, bonuses and indirect compensation $17,402 ($20,560), shares 1,098 (60); R. P. Foreman, secretary and director, salary $12,000, bonuses and indirect compensation $17,402 ($20,560), shares 1,700 (100); W. F. Johnston, comptroller and assistant treasurer-secretary, salary $9,050 ($8,400), bonuses and indirect compensation $12,181 ($11,553), shares 865 (100); C. F. Sharp, assistant vice president sales, salary $8,800, bonuses and indirect compensation $2,041, shares 281; C. H. Calhoun, vice president engineering-maintenance, salary $10,374, bonuses and indirect compensation $705, shares 50; and J. D. Crane (deceased), vice president, salary $1,000 ($10,000), bonuses and indirect compensation $10,151 ($20,560).

Persons other than company officials receiving more than $10,000: Cummings, Stanley, Truitt & Cross, Washington, D. C., legal services full year, $41,250 ($25,000); Loftin, Anderson, Scott, McCarthy & Preston, Miami, legal services full year, $42,221 ($25,000); Gramercy News Associates, New York, advertising June-Dec., $21,000; Hill & Knowlton, New York, public relations Jan.-June, $14,898; S. S. Tyndall, New York, public relations July-Dec., $18,250.

Other directors: John W. Cross, shares 300; G. W. Gibbs, Jr., shares 60; Burke O. Hedges, none; Paul R. Scott, shares 3,000; Salim L. Lewis, shares 500; J. A. Thomas, shares 3,000; J. A. Waterman, shares 506.

Stockholders holding more than 5% of total stock outstanding Dec. 31: Baker, 168,464 shares, 17%; Carothers & Clark, Wilmington, Del., 100,000 shares, 10%; Merrill Lynch, Pierce, Fenner & Beane, 77,937 shares, 8%.

SHORTLINES

▶**Allegheny Airlines** March traffic gained 21% from a year ago to 13,038 passengers. Revenues of $123,000 compared with $94,233 a year ago.

▶**American Airlines** starts transcontinental DC-6 aircoach from Boston June 28, following lead of United in introducing DC-4 coach to Boston.

▶**British Overseas Airways** is cutting en route ground time on jet Comets from 60 min. to 40 min. . . . BOAC subsidiary British West Indian Airways has boosted fares to about the IATA rate, "to offset steadily rising costs." Fares have been "at a level far below those recommended by the International Air Transport Association," BOAC says.

AIRBORNE BASSINET

Mothers taking infants with them on Pan American World Airways' Pacific-Alaska Division find this airborne bassinet handy for keeping junior in his place. The device bolts onto a bulkhead ahead of the seat occupied by the mother. A plastic strap keeps baby from wandering if mother wants to leave her seat. Two such bassinets are carried aboard each PanAm PAD Clipper.

▶**California Central Airlines** asked California Public Utilities Commission to stop Pacific Southwest Airlines undercutting the current $13.50 L. A.-San Francisco coach fare by $1.80. Both are intrastate operators outside CAB rate-making authority.

▶**Eastern Air Lines** annual report (AVIATION WEEK Mar. 30, p. 83) predicts that operating expenses will increase this year, but "not in proportion to the indicated increase in operating revenues," which have averaged 40% above a year ago early this year.

▶**Japan Air Lines** plan to buy DC-6Bs for trans-Pacific service has fallen through, at least temporarily, industry observers report.

▶**North American Airlines,** largest domestic nonsked, is ordered by CAB to go through formal Board hearings to keep its name. Competitor American Airlines argues that the nonsked name infringes on the AA's name, and also that North American flies more often than CAB economic regulations permit. North American contends it was incorporated under the name several years ago, some time before CAB issued a regulation requiring approval of a company name other than that in which original letter of registration was issued.

▶**Northwest Airlines** scheduled passenger-miles in February gained 20% from a year ago to 48,178,428. Load factor was 52%.

▶**Pan American World Airways** says it will extend aircoach around the world next year, closing the gap from India and Honolulu to the Far East. PAA's Latin American Division passengers in 1952 gained 4% from a year ago to 827,693. Cargo gained 3 million pounds to total 23,876,851 pounds. . . . PAA is adding 18 more flights to Puerto Rico this week, making a total of 86 New York-San Juan per week, increasing to 96 from June 1 to Aug. 31.

▶**Philippine Air Lines** has started serving Hamburg and Bangkok on its routes, has dropped Frankfurt, and will soon enter Mexico City, bringing its routes three-fourths round the world.

▶**United Air Lines** plans a 60% increase in capacity by the end of 1955. Company still has on order 30 addition Convairs and 25 DC-7s. These combined with ground facility expansion will cost about $85 million. Delivery schedule calls for 20 Convairs this year, and 10 Convairs and the first of the 25 DC-7s next year.

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

A & E MECHANICS

(C.A.A. License required)

FOR

C-119 and C-123 Aircraft Programs

Interesting and pleasant work in the Flight Test Department. Write or apply in person to

KAISER-FRAZER CORPORATION

WILLOW RUN (Detroit) MICHIGAN

ELECTRONICS ENGINEERS WANTED SOUTHERN CALIFORNIA

Attractive opportunities offered to Engineers experienced in and qualified to design aircraft flush antennas and radomes.

Complete modern facilities for laboratory testing and evaluation available.

Salary dependent upon experience and ability.

Contact Mr. J. C. Buckwalter,

Chief Engineer

DOUGLAS AIRCRAFT COMPANY, Inc.

Long Beach, California

WANTED

CO-PILOT MECHANIC

EXECUTIVE AIRCRAFT

Must be thoroughly familiar with DC-3 —possess A & E with Commercial License and Instrument Rating—must be sober and have neat appearance.

Send complete history of Aeronautical background, photo optional, to

P-7691, Aviation Week
330 W. 42 St., New York 36, N. Y.

National Sales Agency

WANTED

To promote and manage sales for established, progressive East Coast prime manufacturer with $900,000 annual sales volume in exclusively developed and owned aircraft instruments and electro-mechanical accessories. Must have proven sales ability in dealing with military and civilian aircraft manufacturers, government procurement agencies, airlines, and distributors. Commission basis.

RW-7679, Aviation Week
330 W. 42 St., New York 36, N. Y.

obtain your CAA

AIRCRAFT DISPATCHER

rating in four months

CAA approved course available under GI Bill
Other courses
Flight Navigator-Pilot Ground School
Airline Stewardess-Link Instructor
Link Training instruction for pilots

EASTERN AIR NAVIGATION SERVICE

157 West 54 Street New York City

UNUSUAL QUALIFICATIONS

Experienced administrator, 44, married, M.S. in chemical engineering, mainly engaged in aviation, qualified multi-engine pilot. Widely-traveled, resided in Europe, So. Africa, S. E. Asia, Australia, speaks Dutch, English, French, German, Malay. Administrative experience, ability in organizing and managing, familiar with M.S.A. procurement procedures. Good contacts with foreign missions. At present employed at 5 figure salary. Desires position in manufacturing, trade or transportation. Willing to relocate and to travel abroad. Resume and references on request.

PW-7655, Aviation Week
330 W. 42 St., New York 36, N. Y.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

WANTED: SHOP Foreman. Beech Distributor. Write for details. P-7587, Aviation Week.

POSITIONS WANTED

AIRLINE CAPTAIN, college education, fifteen years experience in all phases of civilian aviation desires position as airport manager, executive pilot or flight school operator. PW-6355, Aviation Week.

FREE FERRY Service between Mid-west, West Alaska, till July '54. Comm. pilot, all rates. D. May, 291 Geary, San Francisco.

AIR LINE Captain, 9789 hours, never an accident. Time includes Martin 202, DC3, Lockheed Lodestar, Hudson & Electra, B24, A20, PBY, overseas & domestic. Married 14 years. 2 children, age 41. At present captain on scheduled domestic air line. PW-7414, Aviation Week.

CO-PILOT, ATR. Single and multi land and sea, DC-4, DC-3, JRB, PBM-3R, Flight Instructor, helicopter, ground instructor, 17 years flying, college degree. PW-7591, Aviation Week.

ATR PILOT, 15 years flying experience, 10 years multi engine test pilot. Desires executive transport position. Will arrange interview or submit resume on request. Available on short notice. PW-7565, Aviation Week.

FLIGHT ENGINEER Position Wanted. 3000 hrs. as flight engineer on airline 4 engine equip. Hold recent CAA airman physical and CAA flight engineer written on parts 1, 2, and 3. October 1952. FCC restricted—phone licence.—Limited A&E for 13 yrs. 7 yrs. airline experience, including maintenance, and flight time. Age 33. Available immediately. PW-7589, Aviation Week.

YOUNG MAN—15 yrs. aircraft exp.—8 yrs. admin. exp. in contracts, service and sales for large aircraft mfgr., comm'l. and military. Thorough knowledge of all functions necessary to aircraft manufacture, operation and maintenance-plus organizational ability. Desires responsible position. PW-7485, Aviation Week.

FOR SALE

Grumman Mallard—
1300 hours total airframe, low time engines, 330 gals. gas, complete radio equipment. Price $150,000 asking. William C. Wold Associates, 516 Fifth Avenue, New York 36, N. Y. Telephone MUrray Hill 7-2050.

Douglas A-20
Executive transport—280 MPH cruising speed, zero hours since major overhaul, ready for interior and exterior specifications. For details write William C. Wold Associates, 516 Fifth Avenue, New York 36, N. Y. Telephone MUrray Hill 7-2050.

New Super Widgeon—
Zero hours since manufacture, G-44A converted by Lockheed Aircraft Service to 260 Lycoming. Available 30 day delivery. Price $75,000. William C. Wold Associates, 516 Fifth Avenue, New York 36, N. Y.

SKILLED

PILOTS

AVAILABLE

No Fee to Employers

PILOTS EMPLOYMENT AGENCY

Teterboro (N. J.) Airport
Hasbrouck Heights - 8-1091

PILOT POSITION WANTED

Military and international airline pilot with over 7000 hours and 13 years experience desires position as company or executive pilot. ATR DC-4 and DC-3S. Extensive administrative and personnel experience. Presently in U. S. Navy. Particularly interested in long-term foreign contract.

PW-7629, Aviation Week
330 W. 42 St., New York 36, N. Y.

DESIGN
RESEARCH
DEVELOPMENT

key words to your employment opportunities at GOODYEAR AIRCRAFT . . . pioneer and leader in lighter-than-air craft . . . an established and growing company building an outstanding technical reputation

DESIGN ENGINEERING opportunities exist in the fields of airships, airplanes, and components, airframes, power-plant installations, controls, hydraulics, electronics systems, fuel cells, canopies, and wheels and brakes

DEVELOPMENT of missiles, jet aircraft, and helicopters, electric and electronics system, servomechanisms, fiber resin laminates, and many other projects present an urgent need for capable engineers

WELDING ENGINEERS, civil engineers, mechanical engineers with ability in metals fabrication, and industrial engineers experienced in time study are needed. Job opportunities also exist for technical editors and illustrators

POSITIONS are open at several levels, and inquiries are also invited from recent graduates. Salaries are based on education, ability, and experience

PAID VACATIONS, free group life insurance, a good hospitalization plan, paid sick leave, company-sponsored pension plan, planned recreation, and free parking are among the facilities at the plant

A FRIENDLY CITY, Akron, Ohio, is located in the center of the midwestern industrial region

IF YOU ARE INTERESTED in a secure future, write, giving details, or request an application from

C. G. Jones, Salary Personnel Department

GOODYEAR AIRCRAFT CORPORATION, 1210 Massillon Road, Akron 15, Ohio

TEMCO AIRCRAFT CORPORATION

Dallas, Texas OFFERS ENGINEERS

and OTHER TECHNICAL PERSONNEL

GOOD POSITIONS IN

AERODYNAMICS
ARMAMENT
LOFTING
CONTROLS
STRUCTURES
FLIGHT TEST
ELECTRICAL INSTALLATION
POWER PLANT INSTALLATION
FLUTTER & VIBRATION
ANALOGUE & DIGITAL COMPUTERS
ENGINEERING PROCEDURES & PLANNING

EXCELLENT OPPORTUNITIES

HOUSING READILY AVAILABLE

ATTENTION ENGINEERING PERSONNEL

BOX 6191, DALLAS, TEXAS

New and Challenging Work for YOU in . . .

OPERATIONS RESEARCH

at CONVAIR
in friendly
FORT WORTH, TEXAS

If you have background in . . .

Mathematical Statistics
Operations Research
Physical Chemistry
Cost Analysis
Mathematics
Aeronautics
Electronics
Mechanics
Logistics
Physics

. . . you are invited to apply for a position in CONVAIR'S OPERATIONS RESEARCH GROUP. Excellent opportunities for advancement in aviation's newest science . . . in-plant educational program . . . housing available in all price ranges . . . moving allowances if you qualify . . . generous retirement plan . . . vacations with pay . . . sick leave with pay.

CONVAIR FORT WORTH DIVISION

Send resumé of experience to:

OPERATIONS RESEARCH GROUP
CONSOLIDATED VULTEE AIRCRAFT CORP.
CONVAIR
ENGINEERING PERSONNEL
Attn. M. L. Taylor, Dept. 6-H
FORT WORTH, TEXAS

OPPORTUNITY

FOR

JET POWER PLANT ENGINEER

IN

TULSA, OKLAHOMA

Qualified to Design and Analyze Aircraft Turbo Jet Power Plant Installations, Fuel and Lubricating Oil Systems and Components

Administrative Abilities Desired

Salary Open and Dependent Upon Experience and Ability

Direct Inquiry to
J. L. JOHNSON
Engineering Personnel Manager

DOUGLAS

DOUGLAS AIRCRAFT COMPANY, Inc.
Tulsa Division
TULSA, OKLAHOMA

DEVELOPMENT ENGINEERS

Professionally experienced in development of servo-mechanisms for use in autopilot and missile control systems.

Responsible, stimulating positions in an expanding field offered by progressive organization with established record of advancement in the development and manufacture of aircraft instruments, control systems and communications equipment.

For further information or interview appointment at company expense, send resume of personal background, technical degrees and qualifying experience to:

Personnel Manager

LEAR, INC.
110 Ionia, N. W.
Grand Rapids, Mich.

FUTURE HELICOPTER PASSENGER PROGRAM HAS OPENINGS FOR

Helicopter Pilots, Mechanics, Electrical, Communications, and Accounting Personnel

Address reply direct to:

LOS ANGELES AIRWAYS, INC.
Box 10155 Airport Station, Los Angeles 45, Calif.

California Opportunity

For Acoustics and Vibration Engineers

To conduct tests and analyze problems in acoustics and vibration fields related to aircraft and associated products.

FOR FLIGHT TEST ENGINEERS

To engage in planning, testing and analyzing flight test data obtained on Douglas prototype commercial and military aircraft.

Salary open and dependent on experience and ability.

Contact Mr. W. H. P. Drummond, 3000 Ocean Park Boulevard, Santa Monica, California. Phone: Exbrook 4-3241. Extension 339.

DOUGLAS

DOUGLAS AIRCRAFT COMPANY, Inc.

SANTA MONICA, CALIFORNIA

We desire personnel of the highest caliber—experienced in the field of airborne automatic electro-mechanical control equipment.

★

ENGINEERS

MECHANICAL DESIGN
ELECTRONIC
SERVO

DESIGNERS-LAYOUT MEN

ELECTRONIC
MECHANICAL

This work deals with the manufacture and development of highly complex equipment of the most advanced type in a new and expanding division of an established firm with 20 years of successful experience in the precision instrument field.

We cite a few of the good reasons why you might like to join our organization . . .

SALARY increases are based on merit and initiative—two weeks VACATION, HOSPITALIZATION BENEFITS, GM's own INSURANCE PLAN—POSITIONS ARE PERMANENT due to long range manufacturing and developing programs—EXPENSES incident to interviews and moving all absorbed by company — HOUSING and LIVING CONDITIONS among the best and finest of any along Lake Michigan.

- We have a Junior Engineering Training Program of one year for inexperienced engineering graduates. Opportunity to become acquainted with all phases of industry.
- For the convenience and direct use of engineers in our Engineering Department, we have our own model shop where highest skilled mechanics are employed.
- Educational opportunities for advanced degrees available at U. of W., Marquette, Technical engineering offered at Milwaukee Vocational School.

. . . all inquiries answered—write or apply . . .

★ *AC SPARK PLUG DIVISION*

GENERAL MOTORS CORPORATION

1025 E. KENILWORTH PL. MILWAUKEE 2, WIS.

MECHANICAL ENGINEERS SPECIALIZED IN SMALL MECHANISMS

PHYSICISTS

SALARIES OPEN

Research and Development

SEND RESUME TO

THE RALPH M. PARSONS COMPANY
BRADDOCK HEIGHTS, MARYLAND

STRUCTURES DESIGN

PROJECT ENGINEERS

Immediate openings available at supervisory level for engineers with 8 to 10 years of aircraft structures design experience. These positions involve responsibility for the structural design of a specific model aircraft or major modification of experimental and production aircraft. Job duties require the ability to direct structures design personnel and coordinate the work of various structures design groups with other engineering groups.

Moving allowance and liberal employee benefits provided. Housing readily available amid the excellent recreational and cultural facilities in the Dallas metropolitan area.

If interested in further consideration for employment with this 35 year old designer and builder of naval fighter aircraft, submit resume to: Engineering Personnel Section, Chance Vought Aircraft, P. O. Box 5907, Dallas, Texas.

CHANCE VOUGHT AIRCRAFT

CHANCE VOUGHT

Dallas, Texas

DIVISION OF UNITED AIRCRAFT CORPORATION

Cessna

ENGINEERING OPPORTUNITIES

with world's leading producer of light commercial airplanes

for

- Aerodynamics
- Design Engineers
- Structures
- Design Draftsmen
- Research
- Flutter & Vibration

work on the design and development of light commercial airplanes, helicopter and a twin jet trainer

Send Resume To

PERSONNEL DIRECTOR

CESSNA AIRCRAFT CO.

WICHITA, KANSAS

OUTSTANDING ENGINEERING OPPORTUNITY

Are you a specialist or a recent graduate proficient or interested in one or more of the following fields?

- Aero-thermodynamics
- Internal Aerodynamics
- External Aerodynamics
- Ballistics
- Ram Jet and Turbo Jet Test and Performance
- Transonic and Supersonic Test Operations
- Turbine and Compressor Design

Sverdrup & Parcel, Inc. is engaged in the design of advanced and unusual aeronautical test facilities which require the theory and application of these special fields. The wide variety of our work, embracing the design of general industrial facilities of all types, offers challenging problems and provides excellent opportunity for individual development and advancement. Starting salary and extent of responsibility are dependent upon individual ability and experience. Fringe benefits include: an unusually attractive Employee Benefit Plan which furnishes insurance features and provides for retirement; paid vacations, holidays and sick leave; overtime rates; and an employees' club which offers interesting social and practical values. Two accredited universities offer opportunity for advanced education.

Your letter of inquiry will receive prompt attention and reply. Please write to—

SVERDRUP & PARCEL, Inc.

Consulting Engineers

915 Olive — St. Louis 1, Mo.

WANTED C-47-Bs

Wanted six DOUGLAS C-47 B preferably passenger version up to 15000 hours flying time. Zero hours since complete overhaul incorporating all mandatory C.A.A. directives and Douglas Service Bulletins to date.

ENGINES: Pratt & Whitney R-1830 C 92. Rush detailed offer including price, delivery date, instrument and radio data, exact flying time etc. to:

LINEA AEREA NACIONAL,

Casilla 147-D Santiago, Chile

Cable address: LANCHILE

WANTED

ELASTIC STOP NUTS

WILL BUY EXCESS INVENTORY
STATE SIZE, TYPE, QUANTITY.
IMMEDIATE ACTION

INDUSTRIAL, 212 W. Bigelow
NEWARK, N. J.

All Corporation Pilots—

For complete line of executive aircraft:
For complete service:
For parts and accessories:

on the DC-3, LOCKHEED LODESTAR, TWIN-BEECH, RYAN NAVION, GRUMMAN MALLARD

SEE *WRITE—WIRE—PHONE*

MALLARD AIR SERVICE, INC.

on TETERBORO AIRPORT, N. J.

still temporarily operating out of HANGAR #1 while our new hangar is going up . . . for you!

tel: Hasbrouck Heights 8-1404

MANAGER OF TOOL AND PRODUCTION PLANNING

Wanted by long-established, progressive, expanding manufacturer of airframe components and commercial products, MANAGER to supervise Tool Planning, Tool Design, Tool Making, and Production Control departments. Must have strong recent directing experience in modern aircraft tooling. Production control experience desirable. Age 35—45. Engineering degree desirable. Salary will be appropriate. Location mid-west.

Replies will be treated in full confidence by reputable management consulting firm, and should be addressed to:

GRIFFENHAGEN & ASSOCIATES

333 N. Michigan Avenue Chicago 1, Illinois

Attention: Mr. Larson

EXECUTIVE

D-18-S Beechcraft

150 hrs. since 1000 hr. overhaul airframe and hydromatic props., 300 hrs. TSO on R-985-14B engines, deluxe radio and radio panel, consisting of 3 VHF Trans., 2 VHF Rec., Omni, ILS & Glide Path with flag alarm indicator, Marker Beacon, ADF, LF Rec. Standby. Executive interior consisting of 3 fully reclining chairs and one 3-place divan, or 5 fully reclining chairs. Lavoratory and buffet, super sound-proofing; Aeroquip hose. De-icer and anti-icer, 80 gal. nose tank, available immediately.

AMERICAN AIRCRAFT CORP.

Teterboro, N. J. HA 8-0279—8-1482

EXECUTIVE TRANSPORT AIRCRAFT
BUYING OR SELLING

Either way our 29 years of experience and nation-wide contacts are at your service in Personal, Executive and Transport Aircraft.

JIM WELSCH
AIRCRAFT SALES
60 East 42nd Street, Suite 628
New York 17, New York Murray Hill 7-5884

NAVCO, Inc., HAS IN STOCK
for Executive Aircraft
New, Factory Fresh

Goodrich (Hayes) Brakes for DC-3, C-47
Deicer Boots for DC-3, C-47, D18, Lodestar, PV1
AN3025-1 Relays, reverse current
1589 Bendix latest Voltage Regulators
A.R.C., Bendix, Collins Executive Radio

AIREX SERVICE—phone Terryhill 5-1511
Lambert Field St. Louis, Missouri

FOR SALE

HILLER HELICOPTERS

Two Model 360—Mfd. 1950. Excellent condition. Spray & dust equipment.

FS-6658, Aviation Week
330 W. 42 St., New York 36, N. Y.

AT-6 **SNJ**

AIRCRAFT *For Sale*

Limited quantity available. Also spare engines and propellers. Offers invited. *Write, wire or telephone:*

JOHN B. ROSENTHAL, INC.

1025 Merner Rd. San Mateo, Calif.
Phone: Diamond 4-0503 Cable: Jonro Sanmateo

INSTRUMENTS

Authorized Factory Sales for and Service

*** Eclipse–Pioneer**
*** Kollsman**
*** U. S. Gauge**

C.A.A. Approved Repair Station #3564

Contractors to U. S. Air Force

Our stock of instruments is one of the largest in the East.

IMMEDIATE DELIVERY

CALL • WIRE • WRITE

INSTRUMENT ASSOCIATES

Telephone: Great Neck 4-1147
351 Great Neck Road, Great Neck, N. Y.
Telegraph: WUX Great Neck, N. Y.

FOR SALE

1951 Beech Bonanza—Model C-35—159 hours since new—Lear VHF-OMNI-ADF-FLARES—Propeller Gov.—Metal Propeller—Full Panel—Auxiliary Gas Tank—Tinted Glass—Price $17,500.

1948 Cessna 195-300 H. P. Jacobs—Fully painted, looks like new—ARC-OMNI—Glide Path—ILS—Plus G. E.—Wheel Pants, Flares—New Interior—Corp. owned since new—Price $10,500.

FOR YOUR AVIATION NEEDS CONTACT:

L. B. S. AIRCRAFT CORP.
P. O. Box 123, Int'l Airport
Miami 48, Florida
Tels. 64-1574, 64-9611 & 88-5317

FOR SALE

Two Wright 1820-60 1200 HP Two Speed Engines

Same as 704C9GC used in Lockheed Lodestar. Zero time since first overhaul. AD notes including carborized wrist pins complied with. **$3750.00 each** FOB Bridgeport. Call or write:

Bridgeport Flight Service, Inc.

MUNICIPAL AIRPORT—STRATFORD, CONNECTICUT

WINGS FIELD AMBLER, PA. **WINGS, INC.** PHILA. INTL. AIRPORT

AIRCRAFT SALES & SERVICE SINCE 1929

Consult Us with Confidence before BUYING or SELLING any type aircraft

You Pay Nothing for Our EXPERIENCE and INTEGRITY

AMBLER 1800

HAMILTON-STANDARD

Propellers 2B20/6135A-9 & -15, Blades 6101A-12, 6135A-9 & -15 6137A-15 & 6497A-6, Hubs 2B20/229, 2D30/247, Spinners 2D30, Governors 1A2, 1A4, 1M12 & 4G8, C/W Bracket 51430—All items new or C. A. A. Certified.

AERO PRECISION INDUSTRIES
Box 5117 Oklahoma City 7, Oklahoma

EXECUTIVE AIRCRAFT

Travel the modern efficient way – in your own Flying Office

EXECUTIVE

DC-3s

AVAILABLE TODAY

DELUXE EXECUTIVE $168,000

PW R1830-75 engines, Aeroquip, Skylac, Hayes brakes, complete deicers, electric boosters, shutoffs, Edison fire detectors, airstair door, complete paint, hot air heat, auto cabin heat control, galley, divans, reclining swivel chairs, map table, dual Collins 51R VHF Omni, dual ADF, 51V glide slope, 17L VHF transmitter, 3 lite marker, isolation amplifier, speakers, dual instrumentation, Fiberglas insulated, new license and new ship guarantee, etc. Many other deluxe particulars. The finest in executive DC-3 today.

SPECIAL EXECUTIVE $110,000

Hot air heat (air *and* ground), automatic cabin heat control, new executive interior, galley, divans, airstair, painted top and bottom, complete deicers, flashers, Edison fire detectors, shutoffs, electric boosters, Aeroquip, Wright 202 engines, Collins 51R VHF omni, ARC-1 (50 ch) VHF, ADF, RTA-1B, R89B, BC733, MN32, radar, 3 lite marker, LF receiver, etc. Many extras. Good looking, safe, serviceable, economical. New license, new ship guarantee.

OTHER MODELS FROM $75,000

LOCKHEED LODESTAR Deluxe Executive $85,000

Luxurious divans, swivel chairs, Fiberglas insulated, observation windows, bar, galley, cabin radio, complete paint, Edison fire detectors, sealed gas tanks, dual fuel system, electric shutoffs and boosters, down latches, complete deicers, Wright 202 engines, Aeroquip, dual instrumentation, single panel, ARC-1 (50 ch) VHF, A.R.C. 15 Omni, 17 VHF receiver, F-11 Isolation amplifier, speakers, Bendix marker, Collins 17K VHF transmitter, Collins 1854 MHF transceiver, dual ADF, LF transceiver, ILS. New ship guarantee. Now in use by present, original corporate owners. Taken in trade by us on DC-3. Converted and always maintained by us. Includes 2 run our engines and 2 NT50 props.

2 SUPERIOR D18s BEECHCRAFT
$48,500 $58,500

LAMBERT FIELD CAbany 5425 ST. LOUIS 21, MO.

REMMERT-WERNER, Inc.

For Sale By Owner

IMMEDIATE DELIVERY
N-733A

DC-3A

21 passenger, airline interior, 225 hours since major overhaul, engines 1830-92, 350 hours since overhaul, all modifications to date, located New York, $79,000.00.

Frederick Silver

110 East 42 Street ***Lexington 2-9440*** **New York, N. Y.**

FOR SALE
DC-4's—DC-3's
Lodestars—B-25J
Contact us for details
No charge for listing your aircraft
WESTAIR (Dept. AW)
WESTCHESTER COUNTY AIRPORT
White Plains, N. Y. White Plains 6-9720

FOR DC-3's SALE

We own and have available for immediate sale several low time Eastern Airlines DC-3. They are fully equipped for scheduled airline operation. All are equipped with full radio, Airstair Door, Jantrol Heater. Available immediately. Can be inspected Miami, Fla., or Fort Wayne.

LEEWARD AERONAUTICAL
Miami, Fla. Phone 64-4384 **Fort Wayne, Ind. Phone H-2148**

FOR SALE

F-51 D

NORTH AMERICAN

MUSTANG FIGHTER AIRCRAFT

22 IMMEDIATELY AVAILABLE

DEAL DIRECT
WITH OWNER

ERLE L. BACON CORP.

SANTA MONICA AIRPORT
SANTA MONICA CALIFORNIA U.S.A.

PHONES

EXBROOK 7-3581 TEXAS 0-5107

LOCKHEED PV-1

AVAILABLE FOR IMMEDIATE SALE AND DELIVERY

SPEED 260 MPH — RANGE 1500 MI.

SHIP LIKE NEW—APPROXIMATELY 59 HOURS SINCE NEW. WILL STAND RIGID INSPECTION. SHIP UNCONVERTED. MAY BE INSPECTED AT OUR FORT WAYNE BASE

CALL OR WRITE

LEEWARD AERONAUTICAL

Harrison 2145 Fort Wayne, Indiana

BAER FIELD P. O. Box 210

LOCKHEED LODESTAR 18-56

Licensed

62 hours since airline overhaul of airframe and factory overhaul of 704C9GC engines.

For complete specifications call or write:

Jack Hale

OHIO AVIATION CO.

Dayton Municipal Airport, Vandalia, Ohio

Phone 44646

NOORDUYN NORSEMAN

A beautiful plane in excellent condition with only 61 hrs. since complete fuselage major overhaul and zero time on wings since overhauled and newly recovered. Total time 410 hrs. All bulletins complied. Licensed to November, 1953. Price just reduced to $12,000 flyaway Glendale, Calif.

THE BABB COMPANY, INC.

104 Peddie St., Newark, N. J.
1007 Airway, Glendale, Calif.

For Sale By Owner

IMMEDIATE DELIVERY

Four R-2000-7 Engines

- No time since overhaul by Dallas Airmotive, Inc.
- Complete with magnetos, carburetors and crates.
- $8,000.00 each FOB Texas.
- 1830 engines also available.

FREDERICK SILVER

110 East 42 Street *Lexington 2-9440* New York, N. Y.

AIRLINE SEATS

for DC3—DC4—DC6, and Lockheed Constellation

Warren McArthurs, Hardman, Douglas and Payloads. LO and HI density — Singles, doubles, triples. Delivery from stock.

TRANSPORT AIRCRAFT—ENGINES

A. K. Rozawick, Pres.

AIRLINE EQUIPMENT CORP.

SUITE 704 - ROCKEFELLER CENTER
610 FIFTH AVE., NEW YORK 20, N.Y.
Circle 5-6920-6921
NEWARK AIRPORT NEWARK, N.J.
MARKET 2-0963-4

C47-A CENTRE SECTION

FOR SALE

Overhauled to latest C.A.A. & Douglas specs. Complete with new skin. Less tanks.

F.O.B. Miami, Fla.....$16,500

QUIPCO ASSOCIATES, INC.

P. O. BOX 125 MIAMI 35, FLORIDA

Subsidiary of

AIR CARRIER SERVICE CORP.

1744 G ST., NW WASHINGTON, D. C.

CONTACT EASTERN ON

single • twin • multi-engine aircraft *for*

Airline - Corporate - Military Use

DOMESTIC and WORLD WIDE REPRESENTATION

• COMPLETE SPECIFICATIONS
• ACCURATE WORLD MARKET REPORT

YOUR DIRECT INQUIRY INVITED

Cable • Phone

EASTERN AIRCRAFT SALES CORP.

15 MOORE ST., NYC • CABLE EASTERNAV
tel: Hanover 2-0668, 0669

LONDON, ENGLAND • cable Eastavair
tel: Welbeck 9844, Ext 189

Over 20 Years Airline Experience now serving

Executive and Corporation Aircraft

PRATT & WHITNEY WRIGHT

Home of the P&W R1830-Super-92

ENGINE WORKS

LAMBERT FIELD INC. St. Louis, Mo

BEECHCRAFTS

Excellent used Twins and Bonanzas. Guaranteed to be as represented.

For the best used BEECHCRAFTS, contact your - BEECHCRAFT DISTRIBUTOR -

ATLANTIC AVIATION CORPORATION

Teterboro Airport, Teterboro, N. J.
Tel: Hasbrouck Heights 8-1740

EXECUTIVE AIRCRAFT

One of the finest Lodestars in this country

Available for Immediate Delivery

FS-7521, Aviation Week
520 N. Michigan Ave., Chicago 11, Ill.

"SEARCHLIGHT" IS Opportunity Advertising

—to help you get what you want.
—to help you sell what you no longer need.

Take Advantage Of It

For Every Business Want

"THINK SEARCHLIGHT FIRST"

BUY FROM ONE SOURCE!

Save time—save money—buy unused aircraft parts from one of the largest most diversified warehouse stocks in the country!

Quan.	Part No.	Mfg.	Description
20	36001-0	Eclipse	Compass
11	14601-1F-81	Eclipse	Gyro Indicator
10	15401-1	Eclipse	Amplifier (PB10) w/ED3 MOUNT
52	10078-1AG	Eclipse	Gyro Indicator
62	CQ-9	Eclipse	Clutch Switch (PB10)
11	12086-1C	Eclipse	Amplifier
19	15100-1B-A1	Eclipse	Pitch Trim Gauge
8	20000-43A-13A1	Eclipse	Magnesyn Transmitter
67	23000-2A	Eclipse	Magnesyn Indicator
15	22191-11-A4	Eclipse	Pressure Trans.
6	2296-11C-3A	Eclipse	Dual Tach.
9	20100-42B-14A2	Eclipse	Torque Ind.
9	20000-8A-14	Eclipse	Magnesyn Pos. Ind.
23	20100-11C-4-A1	Eclipse	Wing Flap Indicator
11	DW-33	Eclipse	Transformer
23	CQ-2	Eclipse	Switch Box
75	1195-4-A	Eclipse	Vibrator
80	DW-28	Eclipse	Transformer
11	2227-11-D3A	Eclipse	Tachometer
75	1416-12E	Eclipse	Starter
100	716-3A	Eclipse	Generator (NEA-3A)
384	564-9A	Eclipse	Oil Separator
71	828TY13Z2	Weston	Oil Temp. Indicator
40	119862	Weston	Carb. Air Temp. Indicator
400	AN5780-2	Weston	Wheel & Flap Position Indicator
1000	AN5780-2	G.E.	Wheel & Flap Position Indicator
40	828TY12Z2	Weston	Dual Carb. Temp. Gauge
11	727TY70Z2	Weston	Air Temp. Ind.
85	727TY79Z2	Weston	Air Temp. Gauge
88	727TY73Z2	Weston	Air Temp. Gauge
83	727TY74Z2	Weston	Air Temp. Gauge
10	728-40Z2	Weston	Air Temp. Gauge
91	8DJ29AAY	G.E.	Cowl Flap Ind.
22	77C5	Lewis	Carb. Air Temp.
16	76B19	Lewis	Cyl. Head Temp.
23	77C3	Lewis	Oil Temp. Gauge
13	77C4	Lewis	Oil Temp. Ind.
30	47B21	Lewis	Free Air Temp.
33	47B22	Lewis	Air Temp. Gauge
28	47B23	Lewis	Air Temp. Gauge
54	47B24	Lewis	Air Temp. Gauge
22	906-6-011	Kollsman	Diff. Press. Gauge
48	2548K-6-052	Kollsman	Diff. Press. Gauge
33	DW-47	Eclipse	Transformer
46	117-47	Edison	Fire Detector
19	117-10	Edison	Control Box
200	981280	Kidde	CO2 Cylinders
43	966098	Kidde	Interconnector
104	966679	Kidde	Pressure Control
225	981591	Kidde	Tee
151	A-4614	Kidde	Switch
47	M870036B	Kidde	CO2 Cyl.
74	923748	Kidde	Oxygen Cyl.
326	982585	Kidde	Valve
325	AN60009-1B	Oh. Chem.	Valve
247	AN6009-2A	Oh. Chem.	Valve
47	2-1046-76	Parker	Valve (3000 PSI)
115	P4CA2A	Parker	Primer
68	SP4-2746-77	Parker	Restrictor Valve
105	SP4-2746-78	Parker	Restrictor Valve
68	6-746-10	Parker	Valve
40	SP4-2746-79	Parker	Restrictor Valve
48	SP-2746-80	Parker	Restrictor Valve
60	SP4-2746-81	Parker	Restrictor Valve
127	PL9-2546-75	Parker	ConeCheckValve
123	PL9-2546-76	Parker	ConeCheckValve
620	PL9-2546-77	Parker	ConeCheckValve
540	PL9-2546-78	Parker	ConeCheckValve
142	SP4-2746-76	Parker	Restrictor Valve
119	PLY-843-54	Parker	Check Valve
23	PL9-1846-77	Parker	Check Valve
120	MF9-713-15A	Vickers	Hydraulic Pump
124	PF19-713-25BCE	Vickers	Hydraulic Pump
10	PF9-2713-20Z2	Vickers	Hydraulic Pump
327	PF4-713-20BCE	Vickers	Hydraulic Pump
57	MF45-3911-20Z	Vickers	Hydraulic Pump (3000 PSI)
98	AA31400	Vickers	Valve
125	D7818	Adel	Anti icer Pump
250	AN4014	Erie Meter	Wobble (D-3) Pump
45	AN4103-2	Clifford	Brass (Valve #U4785) Oil Cooler
78	AN3213-1	Scintilla	Ignition Switch
250	A-9 (94-3226)	Nesco	Ignition Switch
66	M862A	Jos. Pollack	Master Switch
148	PG208AS1	Honeywell	Switch Air Ram.
40	PG208AS7	Honeywell	Air Ram Switch
18	4582-AA-6C	Dynamic Air Eng.	Blower
24	U-702-15	Joy Mfg. Co.	Blower
20	V301B7	Aerotec	Pressure Relief Valve
419	450	Skinner	Filter
287	1033-4E1	White-Rodgers	Heater Control Switch
126	17322-2	Fenwall	Thermo Switch
34	9804B	Vapor Car Heating Co.	Control Box
25	46B311	Vapor Car Heating Co.	Compensator
202	A812	Interstate Aircraft & Eng. Co.	Solenoid
46	146102	Bendix	Valve (0-500 PSI)
240	1265-900	Airex	Relief Valve
29	HC2109	Air Associates	Hyd. Cylinder
8	HC2110	Air Associates	Hyd. Cylinder
53	AN6203-3	Bendix	Accumulator 10"-1500 P.S.I
90	JH950-R	Jack & Heinz	Starter Motor
140	K14949E	Marquette	Windshield Wiper Kit
188	EYLC-2334	Barber-Coleman	Control
230	921-B	Stewart-Warner	Heater (200000 BTU)
22	0655-D	Aro	Oxygen Regulator
65	ASDC2	CO2 Mfg. Co.	Fire Detector
97	6041-H-146A	Cutler Hammer	Relay (B-12)
237	6141-H69A	Cutler Hammer	Circuit Breaker
47	7264-404	Leach	Relay
22	M-2031	Air Associates	Actuator
11	FYLD2516	Barber Colman	Thermostat
51	AYLZ2284	Barber Colman	Micropositioner
20	79400	Ham. Stand.	Prop. Reversing Control
10	5X18	Woodward	Governor
46	A14-A-9708P	Westinghouse	Contractor
26	70G3	G.E.	Transformer
718	B2A	Square D	Relay
6	83A94	Surface Combustion Co.	Heater
115	C6363-1-5A	Spencer	Circuit Breaker
115	C6363-1-2A	Spencer	Circuit Breaker
33	18784	Adel	Restrictor Valve
1700	AM1614-80	Heinemann	Circuit Breaker
31	BOBX-2	Allied	Relay
85	12994-2	Adel	Lock Valve
805	58G926	G.E.	Ballast Core & Coil
140	58G946	G.E.	Ballast
40	7210-24	Leach	Relay
66	25432	Airesearch	Flex. Cable
518	MT48C	Bendix Radio	Insulator
20	M-101-8	Aerotec	Pressure Switch
12	MT68EG	Bendix Radio	Mount
52	715E	Fulton Syphon	Temp. Control
478	D9530	Adel	Selector Valve
668	D9530-2	Adel	Selector Valve
428	D9560-2	Adel	Selector Valve
179	D9632	Adel	Selector Valve
237	D9696	Adel	Selector Valve
744	D10044	Adel	Selector Valve
244	D10051	Adel	Selector Valve
814	74247 (TY PH3)	Aero Supply	Valve
335	AN5830-1	Whittaker	Valve
74	AN5830-6	Whittaker	Valve
60	AN5831-1	Parker	Valve
130	612-4A	Eclipse	Valve
2200	37D6210 (AN4078-1)	United	Solenoid Valve
1888	K1593-6D	Kohler	Valve
500	NF3-5	Mallory	Noise Filter
90	TA-19B	Bendix Radio	Transmitter
35	RA10-DB	Bendix Radio	Receiver
2585	AN3096-4	Grimes	Dome Light
775	AN3096-5	Grimes	Dome Light
1365	AN3096-6	Grimes	Dome Light
6	610-2C	Eclipse	Vacuum Pump
550	PD12K10	Strombers	Carburetor
236	PR48-A1	Strombers	Carburetor
90	1685-HAR	Holley	Carburetor
19	1375F	Holley	Carburetor
407	SF9-LN-2	Scintilla	Magneto
185000	LS4-AD1	Aero	Spark Plug
1	R1820-52	Wright	Engine
16	R1820-54	Wright	Engine
4	R1820-60	Wright	Engine
1	R1830-43	P & W	Engine
166	1045A	P & W	Bearing
500	3506	P & W	Flange
130	8288	P & W	Follower Ass'y.
814	35814	P & W	Blower Ass'y.
53	48362	P & W	Shaft
75	48363	P & W	Shaft
56	48392	P & W	Sump
390	48461	P & W	Gear
78	76236	P & W	Gear
1178	84289	P & W	Bearing
113	84487	P & W	Housing
77	84591C	P & W	Nose Housing
200	48350-D	P & W	Crankcase Ass'y.
200	84083	P & W	Cylinder
100	84084	P & W	Cylinder
200	84085	P & W	Cylinder
281	CR2791-G100-K4	G.E.	Relay
626	CR2792F101-A3	G.E.	Relay
41	G34464	Guardian	Relay
350	G31509-A	Guardian	Relay
22	146102	Vickers	Brake Valve
9	557-5	Eclipse	Check Valve
107	D12296	Adel	Pump
67	19100-2-1018	Kenyon	Check Valve
88	3135-11C	Eclipse	Pressure Switch
32	3V-217-HC	Pesco	Separator
100	27314	Purolator	Oil Filter
128	3801-3B	Eclipse	Fuel Quan. Gauge
33	420313	Wright Aero	Pump Ass'y.
46	416421	Wright Aero	Drive Ass'y.
76	U635A (AN4000-2B)	U.A.P.	Fuel Strainer
12	U8416-MM	U.A.P.	Oil Cooler Assy.
25	25575	Airesearch	Motor
35	AA14002A	Vickers	Accumulato
21	FD65-5	Diehl	Motor
81	3616	Bendix Radio	Control
23	3620	Bendix Radio	Station Box
335	G1 (94-32376)	G.E.	Oxygen Pressure Signal Ass'y.
180	AW-CV-1-1	U. S. Gauge	Check Valve
740	1C-200	G.E.	Radio Noise Filter
15	1EAR-2808H	Pesco	Pump
7	SP-1-445-8	Parker	Selector Valve
8	1E621	Pesco	Pump
99	NEP-2	Eclipse	Auxiliary Power Unit
16	LER-30D	Lawrence	Auxiliary Power Unit
4	2CM46A2	G.E.	Generator
6	2P248EB	Pesco	Fuel Pump
21	2E258SA	Pesco	Pump
146	AW2-3/4-25K	U. S. Gauge	Manifold Press Gauge (Metric)
27363	CREB3N	Casco	Rod End
18	SA/3A	Kidd	Impact Switch
13	3GBD1A18A	G.E.	Regulator
18273	AN206-K3L2	Fafnir	Bearing
245	LMR-4	Micro	Switch
2094	PM-5	Spencer	Circuit Breaker
44	5BA25D-J4B	G.E.	Motor
31	5AM31JJ9A	G.E.	Amplidyne
111	5AM31NJ10	G.E.	Amplidyne
425	5BA40NJ1A	G.E.	Motor
189	5PD65-MB1	G.E.	Motor
25790	NR6L12	Torrington	Bearing
26	MS49A	Bendix Radio	Antenna Switch
45	D2060	C. P. Clare	Relay
298	727-TY37P	Weston	Air Temp. Ind.
2000	8909-K99	C. H.	Switch
2747	NAF310310-4B	Cannon	Plug
402	NAF310310-5B	Cannon	Plug
132	AN6209-8	Hydro Aire	Valve
50	AN6213-2	Bendix	Hyd. Valve
280	AN6220-4	Aeroquip	Couplings
27	AN6247-2	Adel	Hyd. Valve
14	UA8013-MM	United Aircraft Prod.	Oil Cooler
1175	RS-2	Mallory	Selector Box
172	A7012	Delco	Motor
6	8DJ13ABK	G.E.	Tachometer Indicator
200	2292-1F-2A	Eclipse	Tachometer Indicator
28	AN5770-2	Manning Maxwell Moore	Manifold Pressure Gauge
71	1003-4	Eclipse	Generator
427	NAF1016-1	Adams & Westlake	Light Ass'y.
616	NAF1016-2	Adams & Westlake	Light Ass'y.
1008	1222BF	Leach	Relay
751	B1392T	Teleflex	Gear Box
130	B1394T	Teleflex	Gear Box

COMMERCIAL SURPLUS SALES CO.

4101 CURTIS AVENUE, BALTIMORE 26, MARYLAND **TELEPHONE: CURTIS 3300**

COCKPIT VIEWPOINT

By Capt. R. C. Robson

It's the System, Not the Pilots

Criticism of this column's views on military accidents (AVIATION WEEK Feb. 23), while expected, has come from an unexpected source and in a manner which prompts further elucidation. Many readers apparently felt that an attempt was made to belittle USAF pilots. This is a wrong impression. The fault lies with the system and only a fool would cast aspersions on the attributes of such a group of men.

The two-fold theme of the article in question is simple: that the USAF should use more experienced personnel on their "airline" operations, and that airline-type flying requires specific training. Any hurt feelings involved in these statements should belong only to the higher echelons where training and pilot qualifications are established.

► **Differs With Philosophy**—As one reader put it, "USAF pilots, properly trained, indoctrinated and regulated, can conduct an airline operation . . ." Exactly. The point is that the average Air Force pilot's time is broken down into hundred-hour bits—original training, formation flying, gunnery practice, etc. While I am not acquainted with the experience requirements of these things, I do differ with AF philosophy and believe that airline flying needs more than a few hundred hours, plus adequate training, to attain even moderate proficiency.

It is a matter of common knowledge that military pilots hired by airlines require several years of seasoning to become proficient airline pilots. This does not indicate a deficiency in these pilots as much as it attests to the high order of new skills needed for this job. By the same token I would expect a considerable training period necessary to acquaint me with other flying arts. Crop dusting, ground strafing, jet flying and many others would find me severely lacking because each is a specialized operation in which I have not been "properly trained, indoctrinated and regulated."

► **Air Force Records**—It might be of interest here to mention that some of the most amazing airline operations the world has seen have been conducted by the USAF. During the last war, the Landing Aids Experiment Unit of the Air Transport Command, headed by Lt. Col. E. A. Cutrell, often flew when the airlines were grounded. Later USAF's All-Weather Flight Division, under command of Col. J. Francis Taylor, compiled an even greater record with a scheduled service from Andrews Field to Wilmington, Ohio.

In both cases, competent leadership and supervision, as well as good training and regulation, made for success. As Col. Taylor once said, constant repetition and familiarity with the job helped turn these pilots into master craftsmen. So there is no question that AF pilots, or any others, can do wonders if they are "properly trained, etc." The fact remains that the AF is not doing this and their airline attempt is inadequate.

► **'Old Men' in Cockpit**—Many readers were inclined to scoff at the qualifications needed for airline work. Scoffing, of course, is an optional matter. Certainly there are good, bad and mediocre pilots in all forms of aviation. Deriding experience, however, is treading on thin ground, for there still is no substitute for it whether we are talking about carpentry, surgery, commanding an army or flying a plane. The several allusions to "old men" in the cockpits, familiarity breeding contempt, etc. can hardly be rebutted in this short space. The power control and instrument approach work, terrain and weather flying, navigation and emergency actions of these "old men" are beautiful to watch and can be understood fully only by those who have tried them.

Comments on causes of some airline crashes, attitude toward and training of copilots, comparative safety records and many others cannot be touched upon in this limited space.

AVIATION CALENDAR

Apr. 27-28—Iowa Thermodynamics Symposium, State University of Iowa.

Apr. 29-May 1—1953 Electronics Components Symposium (AIEE-IRE) Shakespeare Club, Pasadena, Calif.

May 6-7—Second annual Skylady Derby, sponsored by Women's National Aeronautical Assn., sanctioned by NAA and conducted under FAI rules. From Fort Smith, Ark., to Memphis, St. Louis, Kansas City and return to Fort Smith. WNAA's twenty-fourth annual convention will follow at Fort Smith.

May 6-9—First annual student competition, Texas section, Institute of the Aeronautical Sciences, Worth Hotel, Ft. Worth.

May 8-9—First Northwest Quality Control conference, sponsored by Seattle section, American Society for Quality Control, University of Washington, Seattle.

May 8-10—Oklahoma City Air Fair, Will Rogers Field, Oklahoma City, Okla.

May 11-13—National Conference on Airborne Electronics, Dayton Biltmore Hotel, Dayton, Ohio.

May 14-16—American Helicopter Society Forum, Mayflower Hotel, Washington, D. C.

May 15—Air Youth Day, Los Angeles International Airport.

May 16—Armed Forces Day, open house programs at local USAF, Navy, Army, Marine and Coast Guard installations.

May 16-17—Virginia Aviation Jubilee air show, Byrd Field, Richmond.

May 18-22—Fifth National Materials Handling Exposition, Convention Hall, Philadelphia.

May 18-22—Aviation Seminar, National Fire Protection Assn. annual meeting, Palmer House, Chicago.

May 18-22—Twelfth annual conference Society of Aeronautical Weight Engineers, Olympia Hotel, Seattle.

May 19-22—Annual convention Aviation Writers Assn., Ft. Worth, Tex.

May 20-22—Spring meeting Society for Experimental Stress Analysis, Hotel Schroeder, Milwaukee.

May 31—Fifth annual Wright Memorial Glider Meet, South Dayton (Ohio) Airport.

June 5-July 5—20th International Aviation Display, sponsored by the Union Syndicale des Industries Aeronautiques, Bourget Airport, Paris.

June 9-11—Second International Aviation Trade Show, Hotel Statler, New York.

June 11-13—Fifth annual All-Women International Air Race, Weeland, Ont., to New Smyrna Beach, Fla., sponsored by Ninety-Nines, Inc.

June 16—Seventh session of the assembly of the International Civil Aviation Organization, Brighton, England. Session is expected to last three to four weeks.

July 15-16—IAS Annual Summer Meeting, Honors Dinner, IAS Building, Los Angeles, Calif.

Sept. 5-7—National Aircraft Show and 50th anniversary of powered flight, Dayton (Ohio) Municipal Airport.

Sept. 7-13—1953 SBAC Coronation Year Flying Display, Farnborough, Hampshire, England.

ADVERTISERS IN THIS ISSUE

AVIATION WEEK—APRIL 27, 1953

AEROQUIP CORPORATION 70
Agency—Hoperaft-Keller, Inc
AIRBORNE ACCESSORIES CORP 8
Agency—Gray & Rogers Adv.
AIRCRAFT RADIO CORP 8
Agency—Burke Dowling Adams, Inc.
ALUMINUM CO. OF AMERICA 88
Agency—Fuller & Smith & Ross, Inc.
AMERICAN WELDING & MFG. CO 87
Agency—The Bayless-Kerr Co.
ARMA CORPORATION 22
Agency—Doyle, Kitchen & McCormick, Inc.
BENDIX PRODUCTS DIV. BENDIX AVIATION CORP. ..... Third Cover
Agency—MacManus, John & Adams, Inc.
BENDIX RADIO COMM. DIV. BENDIX AVIATION CORP. 28, 29
Agency—MacManus, John & Adams, Inc.
BINKS MFG. CO 77
Agency—Robertson & Buckley, Inc.
CALIFORNIA REINFORCED PLASTICS CO 71
Agency—Raymond I. Lang Adv.
CLARE & CO., C. P 45
Agency—Reincke, Meyer & Finn, Inc.
CONTROL PRODUCTS, INC 83
Agency—George Homer Martin Associates
DOW CORNING CO 81
Agency—Don Wagnitz Adv.
DUNBAR KAPPLE, INC 39
Agency—Ideas Unlimited
EASTERN AIR LINES 33
Agency—Fletcher D. Richards, Inc.
EASTMAN KODAK CO 53
Agency—J. Walter Thompson Co.
EBERHARD FABER PENCIL CO 21
Agency—Hicks & Greist, Inc.
EDO CORP 65
Agency—Davis-Parsons, Inc.
ELASTIC STOP NUT CORP. OF AMERICA 32
Agency—G. M. Basford Co.
ELECTROL, INC 46
Agency—G. B. Woodin Co.
FENNEL INSTRUMENT CO 68
FOOTE BROS. GEAR & MACHINE CORP. ..... Fourth Cover
Agency—Buchen Co., The
GARRETT CORP., THE, AIRESEARCH MFG. CO 5
Agency—J. Walter Thompson Co.
GENERAL CABLE CORP 50, 51
Agency—Hicks & Greist, Inc.
GENERAL ELECTRIC CO 24
Agency—G. M. Basford Co.
GOODYEAR TIRE & RUBBER CO ..... Front Cover
Agency—Kudner Agency, Inc.
HAYDON CO., A. W 60
Agency—Cory Snow, Inc.
HEXCEL PRODUCTS CO 71
Agency—Raymond I. Lang Adv.
HYDRO AIRE, INC 19
Agency—John H. Riordan Co.
INDUSTRIAL TAPE CORP 62
Agency—The Aitkin-Kynett Co.
INTERCONTINENTAL MFG. CO., INC 56
Agency—Interamerican Adv. Agency, Inc.
JOHNS MANVILLE CORP 80
Agency—J. Walter Thompson Co.
KAISER METAL PRODUCTS, INC 85
Agency—B. K. Davis & Bro.
KOLLSMAN INSTRUMENT CORP 89
Agency—Erwin, Wasey & Co., Inc.
LAPOINTE MACHINE TOOL CO., THE 4
Agency—Wells Advertising Agency
LEAR, INC 57
Agency—Buchanan & Co., Inc.
LIBBEY OWENS FORD GLASS CO 73
Agency—Brooke, Smith, French & Dorrance, Inc.
MANNING, MAXWELL & MOORE, INC 90
Agency—Fuller & Smith & Ross, Inc.
MARMAN PRODUCTS CO., INC 48
Agency—West-Marquis, Inc.
MELETRON CORPORATION 76
Agency—Welsh-Hollander Adv.
MINNESOTA MINING & MFG. CO 69
Agency—MacManus, John & Adams, Inc.
NEW DEPARTURE DIV. G. M. C 3
Agency—D. P. Brother & Co., Inc.
NORTH AMERICAN AVIATION CO 105
Agency—Batten, Barton, Durstine & Osborn, Inc.
NORTHROP AIRCRAFT, INC 74, 75
Agency—West-Marquis, Inc.
NUTT-SHEL COMPANY 61
Agency—Welsh-Hollander Adv.
PASTUSHIN AVIATION CORP 58
Agency—Lynn-Western, Inc.
PESCO PRODUCTS CO 63
Agency—Fuller & Smith & Ross, Inc.
PHEOLL MFG. CO 44
Agency—The Cramer-Krasselt Co.
PUROLATOR PRODUCTS, INC 67
Agency—J. Walter Thompson Co.
RADIO CORP. OF AMERICA 84
Agency—J. Walter Thompson Co.
REMINGTON RAND, INC 10
Agency—Leeford Adv. Agency
REVERE CORP. OF AMERICA 26
Agency—Troland, Inc.
ROBINSON CO., RALPH C 61
Agency—Chapin-Damm Advertising
ROHR AIRCRAFT CORP 38
Agency—Barnes Chase Co.
RYAN AERONAUTICAL CORP 42
Agency—Batten, Barton, Durstine & Osborn, Inc.
SAMPSON CHEMICAL & PIGMENT CORP 20
Agency—Austin Advertising Agency
SEARCHLIGHT SECTION 99, 97, 98, 99, 100 101, 102, 103
SENSENICH CORP 85
Agency—Foltz-Wesinger, Inc.
SERVOMECHANISMS, INC 86
Agency—Sanger-Funnell, Inc.
SIKORSKY AIRCRAFT DIV. UNITED AIRCRAFT CORP 34, 35
Agency—Lennen & Newell, Inc.
SINCLAIR REFINING CO 54, 55
Agency—Morey, Humm & Johnstone, Inc.
SMITH MORRIS CO 40
SNAP-ON-TOOLS CORP 36
Agency—The Cramer-Krasselt Co.
SPENCER THERMOSTAT DIV. METAL & CONTROLS CORP 81
Agency—Sutherland-Abbott Adv.
SPERRY GYROSCOPE CO 6
Agency—Charles Dallas Reach Co., Inc.
STEPHEN-DOUGLAS CO., THE 105
SWEDLOW PLASTICS CO ..... Second Cover
Agency—Francis D. Gonda Co.
TIMKEN ROLLER BEARING CO 59
Agency—Batten, Barton, Durstine & Osborn, Inc.
TITEFLEX, INC 27
Agency—John Falkner Arndt & Co.
TOWNSEND CO 49
Agency—Bond & Starr, Inc.
TWIGG INDUSTRIES, INC 47
Agency—Gregory & House, Inc.
TWIX MANUFACTURING CO., INC 23
Agency—Harold Marshall Adv. Co.
U. S. PLYWOOD CORP 52
Agency—Marschalk & Pratt Co.
UTICA DROP FORGE & TOOL CORP 37
Agency—Wilson, Haight & Welch, Inc.
VLIER MFG. CO 66
Agency—Willard G. Gregory & Co.
WESTINGHOUSE ELECTRIC CORP 41, 78, 79
Agency—Fuller & Smith & Ross, Inc.
WHITTAKER CO., LTD. WM. R 43
Agency—Mogge-Privett, Inc.

SEARCHLIGHT SECTION

(Classified Advertising)
H. E. Hilty, Mgr.

EMPLOYMENT
Positions Vacant 96–100
Selling Opportunities Offered 96
Positions Wanted 96
Employment Agencies 96

EDUCATIONAL
Schools 96

PLANES—EQUIPMENT
(Used or Surplus New)
For Sale 100–103

WANTED
Planes-Equipment 100

The Stephen-Douglas Co. INC.

LICENSED ENGINEERS • R & D SPECIALISTS

2950 NEBRASKA AVENUE
SANTA MONICA, CALIFORNIA
TELEPHONE EXBROOK 3-4785

Frankly, working at North American requires hard thinking and plenty of vision. Because North American always works in the future. Yet, if you are interested in advanced thinking, if you'd like to work on the planes that will make tomorrow's aviation history, you'll like working at North American. North American offers these extra benefits, too.

North American Extras—

Salaries commensurate with ability and experience • Paid vacations • A growing organization • Complete employee service program • Cost of living bonuses • Six paid holidays a year • Finest facilities and equipment • Excellent opportunities for advancement • Group insurance including family plan • Paid sick leave • Transportation and moving allowances • Educational refund program • Low-cost group health (including family) and accident and life insurance • A company 24 years young.

Write Today

Please write us for complete information on career opportunities at North American. Include a summary of your education, background and experience.

CHECK THESE OPPORTUNITIES AT North American

- Aerodynamicists
- Stress Engineers
- Aircraft Designers and Draftsmen
- Specialists in all fields of aircraft engineering
- Recent engineering graduates
- Engineers with skills adaptable to aircraft engineering
- Electrical and Electronic Engineers

NORTH AMERICAN AVIATION, INC.

Dept. 10, Engineering Personnel Office
Los Angeles International Airport
Los Angeles 45, Calif.; Columbus 16, Ohio

North American Has Built More Airplanes Than Any Other Company In The World

EDITORIAL

Experiment in Publicity

Aviation executives lost no time acting on an editorial suggestion here Apr. 6 that they report interesting and important activities of their companies to AVIATION WEEK for possible publication as a business intelligence service to readers.

Our staff—the largest working on any single aviation publication—is digging constantly for important aviation technical and commercial news, which we gather, filter and print each week, but we have decided to enlist the cooperation of our readers in covering important information from hundreds of firms which otherwise would not come to the attention of any publication.

Thus, we launch an experiment in business and technical journalism. For several weeks we shall print the best letters we receive, either in full or abridged. Other letters that are not printed may result in our development of stories, based on further discussions with correspondents.

As we pointed out, most companies—even those with public relations departments—fail to take full advantage of the services offered by a carefully read business and technical magazine.

There are probably many firms whose services or products are very unusual or outstanding in their differences, or which perform unique or exceedingly valuable jobs. Remember, such news is most avidly read which is unique, little known, quite different, or reports opportunities for great economy, time saving, new industrial or business possibilities.

Furthermore, your information **must** be important to many business men or technical people—not just a handful. And necessarily, the judgment of the editors in deciding what is printed must be final.

For example, published below is a cross-section of the most interesting letters, abridged, received in the first week after publication of the editorial on Apr. 6. There must be many more companies with deserving news which has never been published anywhere.

* * *

THE LATEST ON A FLYING CAR

Gentlemen:

Your editorial on "How to Publicize Your Company" . . . prompts us to tell you we are still working on the Aerocar. We completed static test phases of our CAA, ATC tests this week, which means we can go ahead on the four new Aerocars we are building.

We have assembled the production prototype sufficiently to permit the various phases of the static test program, and many of the parts for the other cars have been put together as assemblies.

We expect the first production car to be completed in about 60 days and will then submit it to CAA for flight evaluation with the further hope that we can obtain ATC by summer. . . .

The new Aerocars embody . . . new features, such as automatic unlocking of the flight controls when the wings-tail are installed to prevent a takeoff with controls locked; arranging the fuel-flow system to eliminate the fuel pump and rely on gravity feed; shoulder harness; popout windshield, and a better than 10G engine mount.

The capital problem still slows our progress. Incidentally, no small part of the credit for getting our static test program completed goes to CAA. They have been more than cooperative with their counsel and guidance. And when we couldn't find suitable lead for leading the wings and other components, Boeing Aircraft loaned us shot bags and other materials, as though we were big neighbors. Who says cooperation isn't possible in the industry?

Molt Taylor
Aerocar, Inc.
Longview, Wash.

* * *

THIS COMPANY FERRIES YOUR PLANES ANYWHERE

To the Editor:

. . . We are the largest organization of our type, primarily designed for aircraft delivery throughout the world. We have done the major work for a considerable number of overhaul and airframe manufacturers in the ferry delivery of their aircraft. . . .

We have for the past two years been delivering the de Havilland Doves to Canada and the U. S. We are approaching in the near future the 100th Dove to be flown across the North Atlantic to this continent. Last week we delivered the first Heron (four-engine Dove). This was the first of its type to hit this country. . . . The first Heron was the feederline model and has the fixed gear. We are informed by de Havilland that before too long they will have production on the retractable gear version, which will be imported to this country. . . .

We also delivered the first Aero Commander exported from this country—through the North Atlantic, Europe, Near East, Far East to Tokyo. The second Commander is en route to Tokyo. In both the Heron and Commander, Jack Ford, our president, delivered the first of their type and set up the operational procedure for those to follow.

We at Fleetway have enjoyed your factual articles immensely. . . . We pay great attention to your Searchlight section.

Frank D. Oergel, Jr., Director of Operations
Fleetway, Incorporated
Lockheed Air Terminal, Burbank, Cal.

* * *

MAKING SOMETHING OUT OF NOTHING

Gentlemen:

I am not ordinarily given to writing letters to the editor. In the case of your magazine, the main reason is that I find practically nothing to condemn or disagree with. As a regular cover-to-cover reader, I find your magazine makes me conversant with men in all branches of aviation, on new developments, and who's doing what, where.

We think possibly our service to the aircraft industry is unique, touching all phases of aircraft construction, including airline maintenance.

In 1943, at the request of the Douglas Aircraft Co. here, we developed a series of machines which could segregate mixed parts accurately, economically, and quickly. I refer to aluminum rivets, nuts, bolts, screws and other small aircraft hardware—everything from two sizes of rivets mixed by accident in roto-bins and stock rooms to the raw floor sweepings in which we have found as many as 18,000 separate items to recover.

Since 1943 we have sorted and returned to the aircraft industry 3,000,000 pounds of small hardware which otherwise would have been sold for scrap. We know of only one other such company in successful operation—Industrial Aids, Inc., of Compton, Cal. whose president, Mr. Roy C. Buck, was a partner with us during the development of this machinery.

Our company has done work on everything from 10 pounds of mixed nuts for a Denver dealer to 55,000 pounds in one lot for one of the country's largest Air Force prime contractors. We are now under contract with McDonnell Aircraft Corp., and have completed in three months over 30,000 pounds of mixed material.

S. B. Mattison, President
Mattison Metals, Inc.
Oklahoma City 14, Okla.

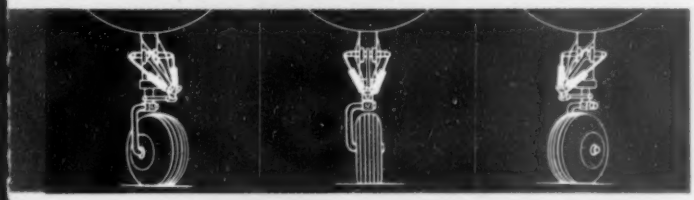
* * *

So you don't need a publicity man to tell us that you are doing work of unusual interest. If you are an executive, write a letter on your firm letterhead to the Editor of AVIATION WEEK, 330 West 42nd St., New York, 36, N. Y.

—Robert H. Wood

Bendix Torque-Link Steering

A new and better steerable nose gear design... Easier and more efficient steering action... Important savings in weight, space and maintenance.



Bendix Torque-Link Steering is a rugged self-contained unit which can be built in as an integral part of any nose strut.

This simple compact steering unit actually does the work of two conventional mechanisms. The hydraulic power cylinders take the place of the upper scissor member of usual torque links. They serve the double purpose of torque links and steering actuators. Thus, with one unit performing dual functions, Bendix Torque-Link Steering obtains important savings in weight, space and maintenance.

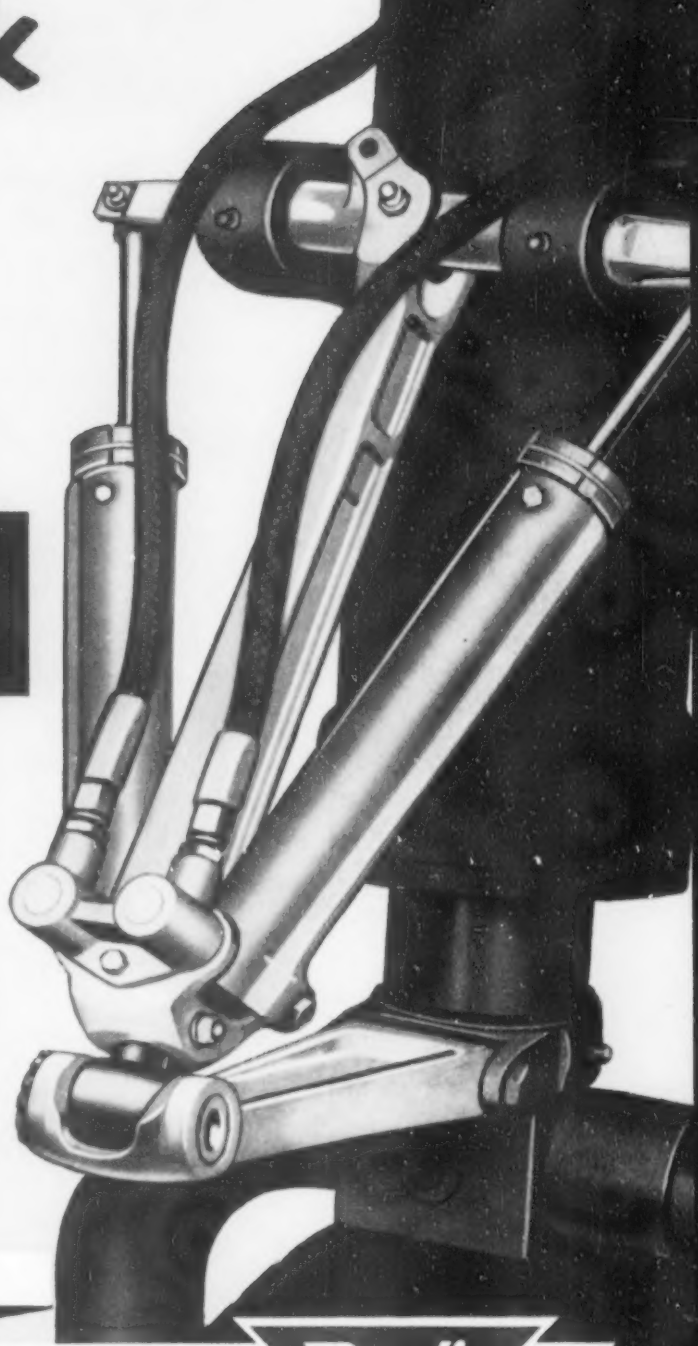
In addition, shimmy dampening is more effective because dampening forces are applied at a point where there is the least amount of spring action in the system.

Although Bendix Torque-Link Steering is a new conception of more efficient steering action, it has been fully tested and proved. After exhaustive laboratory tests it is now being used on several of the newer planes with excellent results.

Bendix engineers welcome the opportunity to assist air frame designers in the application of this Torque-Link Steering to their new airplanes.

BENDIX PRODUCTS DIVISION **SOUTH BEND** INDIANA

Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, N.Y.



LEADER IN LANDING GEAR

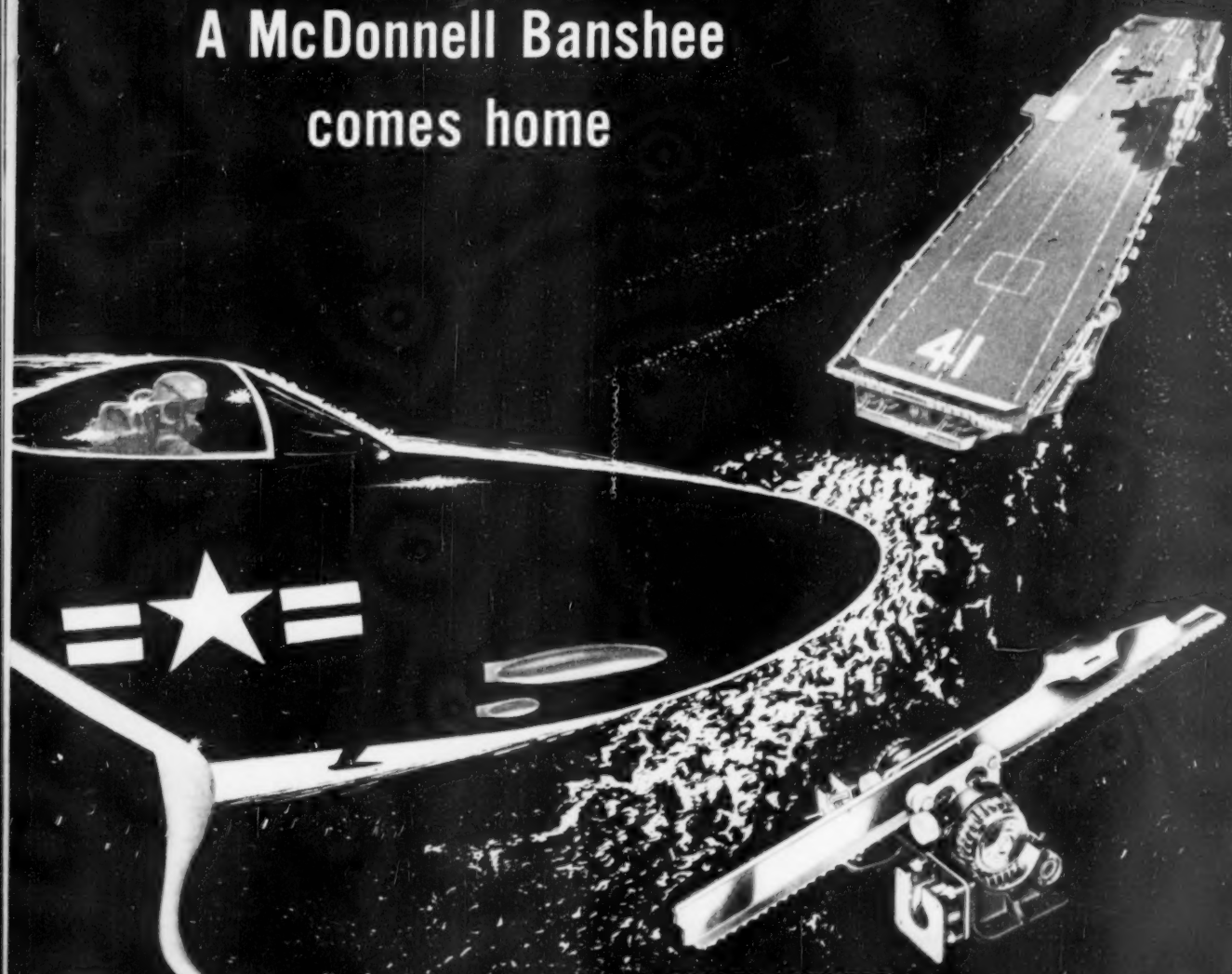
FIRST IN FUEL METERING

Bendix Products Division

OPPORTUNITIES FOR ENGINEERS
in Electronics, Mechanics and Hydraulics

Bendix Products offers exceptional opportunities to engineers. This division of Bendix is among the world leaders in developing and manufacturing a wide variety of products currently in use by commercial as well as military aviation. Investigate your opportunities with Bendix. Write Administrative Engineering, Bendix Products Division, Bendix Aviation Corporation, South Bend, Indiana.

A McDonnell Banshee comes home



CANOPY ACTUATOR
ON THE McDONNELL F2H-3
DESIGNED AND MANUFACTURED
By

FOOTE BROS.

Better Power Transmission Through Better Gears

FOOTE BROS GEAR AND MACHINE CORPORATION 4545 SOUTH WESTERN BOULEVARD CHICAGO 9 ILLINOIS